



HITACHI

SERVICE MANUAL

TK**No.1706E****VT-6800A****VT-TU68A**

Technical Information

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

PORTABLE VIDEO DECK. VIDEO TUNER

APRIL 1982**TOKAI WORKS**

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OUTLINE AND RELATED MATERIALS

System 6800 was produced by adding functions to System 6500, and the differences between the models are as shown in the table.

Related materials

VT-6800A, VT-TU68A Service Manual No. 1705E
 VT-6500A, VT-TU65A Service Manual No. 1520E
 S₂ Chassis Service Manual No. 1522E.F.G

DIFFERENCE TABLE

Different point	System 6800	System 6500
Features	[SYSTEM 6800]	[SYSTEM 6500]
Remote control system	Wireless: (Infrared rays)	Wired
Recording program	8 programs in 3 weeks	8 programs in 2 weeks
Power control of VTR Variable speed play	By power switch of VTR Possible in both standard and triple speed modes	By power switches of VTR and tuner Possible in triple speed mode
(Video head) Record check function	(4 heads) Provided (at System Control)	(2 heads) Not provided
Mechanical section	[VT-6800]	[VT-6500]
Video heads	4 heads	2 heads
Remote control jack	At the back	At the front
SLOW X value control arm control arm	Not provided	Provided
Cylinder tach magnet	1	2
Remote control select switch (Camera/VTR)	Provided on Side	Not provided
	[VT-TU68]	[VT-TU65]
Timer switch	Provided (button switch)	Lever switch used for both power and timer
Power switch	Not provided	Not provided
Remote control cable	At the back (connected to VTR)	Not provided
Time set buttons	Numeral direct input type, 12 buttons	Numeral feed type, 6 buttons
Electric circuit	[VT-6800]	[VT-6500]
Video heads	28 μ m/32 μ m (LP/EP/mode) 75 μ m/90 μ m (SP mode)	28 μ m/32 μ m

	[VT-TU68]	[VT-TU65]
Servo/Jack board ● Jack	- Hybrid ICs: 1 for power 1 for signal - Camera jack with switch - Camera remote, camera jack - 3 - Remote control switch - Remote control power supply, tuner jack - 11	- Hybrid ICs: 1 for power 3 for signal - Return video, camera jack - 3
- Auto-speed detector circuit - Servo - Slow speed/tracking circuit - Cylinder speed control circuit - Capstan servo output correction circuit - Search SW 30 Hz correction circuit - Skewing correction circuit	MSL9372 IC501: TA4341 IC502: TA4342 IC503: TA4343 IC504: TA4344 IC505: TA4345	HA11721 & transistor
Head switching board ● Head switching circuit	Transistor: 1 Relay: 1	Not provided
YC board Color control circuit Additional V circuit	IC203: HT4226 IC205: TA4351 (for SP/EP) IC207: TA4336	HT4216/TA4302 TA4301 (for EP) TA4315 Exclusive for EP
Record circuit SP/EP characteristics selection Video dub (INSERT) circuit Play chroma level select circuit	Discrete components Y/C gain booster Q350 Q301 (corresponding to 4-head system)	Chroma gain booster Q301 (corresponding to 4-head system)
Audio board Switch circuit	TA4437	TA4304
Switching regulator board Capstan drive voltage	Max. 20V	Max. 12V
System control board Microprocessor: IC801	HD 44820A48 ("INSERT" circuit built-in)	HD44820A17 + "INSERT" circuit
Loading motor board	2 transistors added (motor changed)	
Reel motor board Short-circuit detection circuit	Provided (2 transistors)	Not provided

	[VT-TU68]	[VT-TU65]
Regulator board VTR ON/OFF detecting circuit	IC903: NTD6506S	Discrete
Input key board Program keys	15 keys (direct numeral input type)	10 keys (Feed/return type)
Channel selection keys	16 keys/4 bands (1 band for CATV) IC151: μ PC1363	12 keys/3 bands M74LS138P: 2
Channel select indicator driver Mode indicator	• Charge • Timer (2 indicators) Provided (ON/OFF)	• Charge • Timer • Power supply (3 indicators) Provided in Switch board
Timer switch		
Switch board Timer/power switch	Included in Input key board Included in Input key board	Provided (3 positions)
Channel preset board Tuning amplifier	IC702: TA4348	Discrete components
Timer board Timer μ P	8 programs in 3 weeks (HD38800A62) LQT-50X (50 Hz) clock module	8 programs in 2 weeks (MB8851A) 3.58 MHz X'tal
μ P clock circuit		
Power voltage Backup circuit	10V CPS2026 module	5V Discrete components
Remote control transmission/reception board	Provided (encoder/decoder)	Not provided

4 VIDEO HEAD SYSTEM

The 4 video head system has been newly employed so that variable speed play is possible at both standard (SP) and triple (EP) play modes. Heads for the SP mode and for the EP mode are provided independently in the 4-head system of this unit, and video

heads ($75\mu\text{m}/90\mu\text{m}$) are allocated for record and play in the SP mode, and video heads ($28\mu\text{m}/32\mu\text{m}$), for the EP mode. The relationship of the head positions between the VT-6800 and VT-6500 is shown in the table below.

COMPARISON BETWEEN VIDEO HEADS		VT-6800	VT-6500
DIFFERENT ITEM	MODEL		
INSTALLED POSITIONS OF HEADS ON CYLINDER			
HEIGHT OF HEADS			

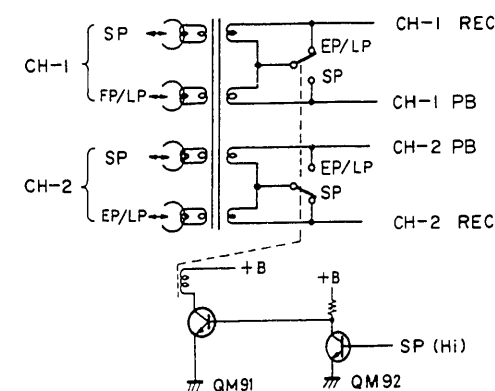


Fig. 1 Head switching circuit

(Comparison between video heads)

Wide heads (CH-1: $75\mu\text{m}$, CH-2: $90\mu\text{m}$) are installed to the cylinder 90° mechanically apart for record/play in the SP mode, and the heads ($28\mu\text{m}/32\mu\text{m}$) exclusively for record/play in the EP and LP modes in this unit.

These SP and EP heads are electrically switched using a relay. The head switching circuit is as shown in the diagram; it is located on the cylinder motor drive board, and the relay is changed over by the SP (Hi) signal obtained at the servo board.

(The $28\mu\text{m}/32\mu\text{m}$ heads are called the $29\mu\text{m}/29\mu\text{m}$ heads to simplify the description on the record/play using the 4-head system)

Record/play using the 2-head system

Quoting VT-6500 as example, the track pattern in SP recording has guard bands between CH-1 tracks and CH-2 tracks as shown in Fig. 2-a. The track pattern in the EP mode results in adjacent $19\mu\text{m}$ tracks in both CH-1 and CH-2 as shown in Fig. 2-b.

When these patterns are traced by the same head as in the record mode, the track width and head width are the same in the SP mode as shown in Fig. 2-c, so the max. envelope is obtained, and the head width is wider than the $19\mu\text{m}$ track width in the EP mode, so the envelope is narrower.

Next, the variable speed mode is considered.

In the variable speed play many tracks are traversed; when this is done in the SP mode, the guard band and other

tracks are traversed before reaching the next same channel track, and the VTR enters the play mode with a small envelope (too much noise in the picture) and is not desirable visually. When the variable speed play is done in the EP mode (for example: Reverse search in Fig. 2-d, and Forward search in Fig. 2-e, the guard band is not generated, so the adjacent track is picked up as noise. By this, a rhomb-shaped envelope is obtained in variable speed play in the EP mode, and a picture which is visually reasonable can be obtained.

The 4-head system used in VT-6800 mounts the SP heads separately so that the guard band which occurs in the SP mode of the 2-head system is not generated.

Record/play using the 4-head system

The SP recording is done by the wider heads, so the tracking pattern in this case becomes a $58\mu\text{m}$ adjacent pattern as shown in Fig. 2-f. When this is traced by the same heads as in recording, the track width is $58\mu\text{m}$, so a picture with a better S/N ratio compared with the play during the 2-head play mode is obtained. When variable speed play is performed (for example, Reverse search in Fig. 2-g and Forward search in Fig. 2-h), the guard band is not generated, so it becomes the same as EP variable speed play in the 2-head system.

However, the SP search speed is 4 times in this unit, so the shape of the envelope and appearance of noise in the picture differ from those in the EP mode (12 times speed). Record/play in the EP mode is the same as in the 2-head system described previously.

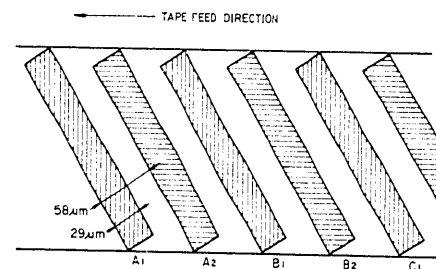


Fig. 2-a VT-6500 SP record pattern

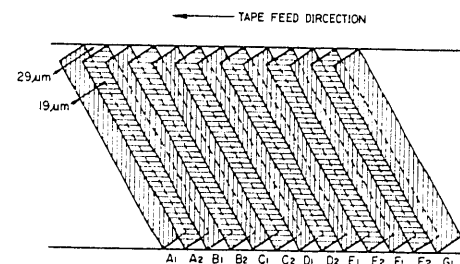


Fig. 2-b VT-6500 EP record pattern

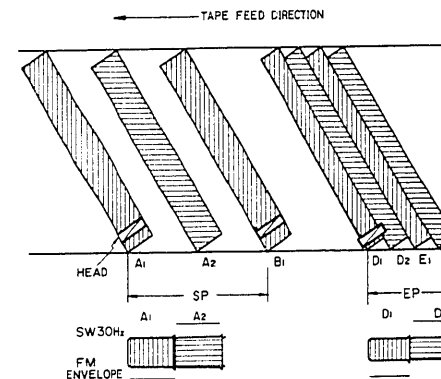


Fig. 2-c VT-6500 play pattern

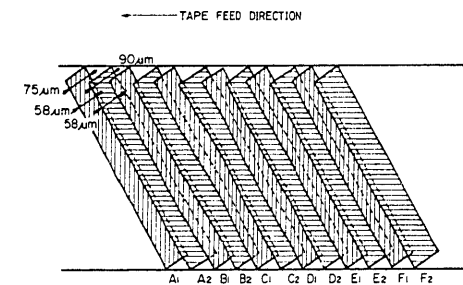


Fig. 2-f VT-6800 SP record pattern

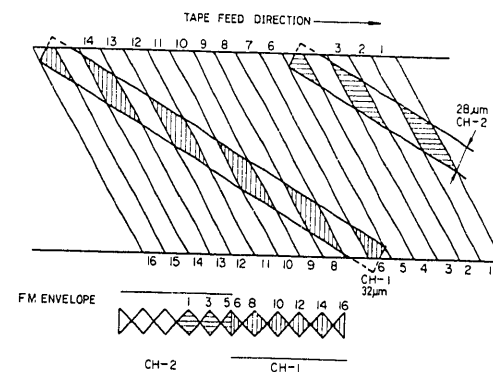


Fig. 2-d VT-6500 EP reverse search (x 9)

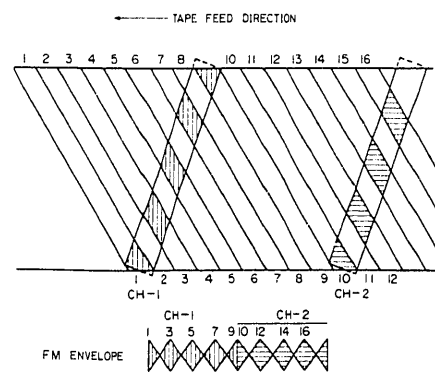


Fig. 2-e VT-6500 EP forward search (x 9)

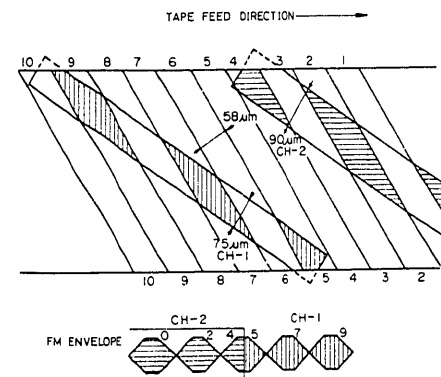


Fig. 2-g VT-6800 SP reverse search (x 4)

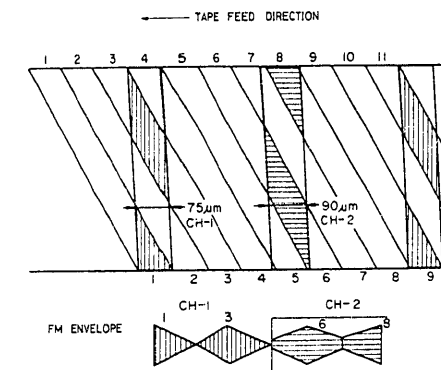


Fig. 2-h VT-6800 SP forward search

SP/EP additional V pulse circuit

This circuit adds a pulse similar to the sync signal to the vertical sync signal to stabilize the picture during variable speed play.

Variable speed play is performed in the EP and SP modes with the 4-head system, but α_H is different, so it is required to change the adding position of the V pulse.

Fig. 3 shows the SP/EP additional V pulse circuit.

The SPEED PLAY (Lo) is applied to IC205-pin 1 from the μP during the variable speed play, and the SW 30 Hz pulse is input to IC205 to shape the V pulse. The SW 30 Hz pulse is delayed by Q2, and Q3 is driven by this pulse.

As a result, the pulse produced by trigger-shaping this delay pulse (around the CH-1 vertical sync signal) and the pulse produced by delay-inversion and trigger-shaping by Q4 (around CH-2 vertical sync signal) are obtained at section A. The Q3 output is delayed by RT203 and C350 during SP, and delayed by RT204 and C289 during EP, and then it is inverted and trigger-shaped by Q4, so the pulse position on the CH-2 side can be set to the position where the picture is stabilized. The MM generates the additional V pulse from the pulse obtained at section A and it is applied to the monitor cut circuit.

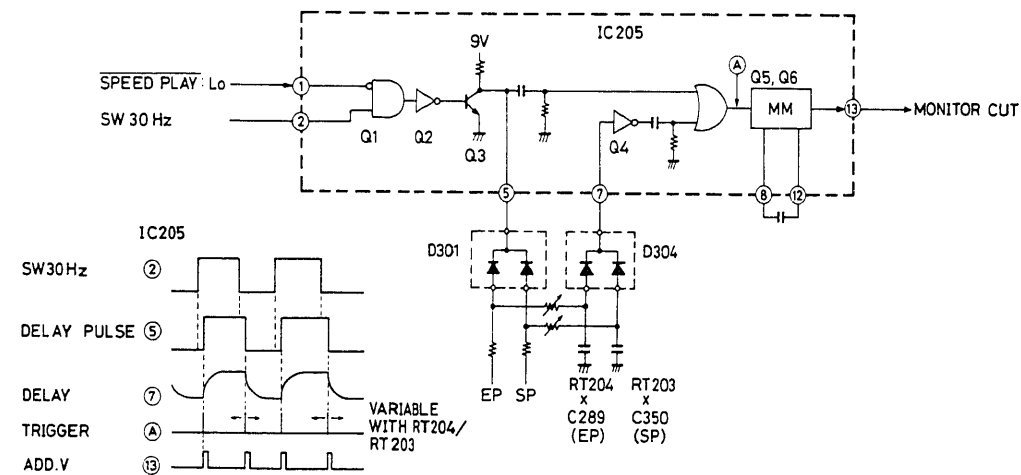


Fig. 3 SP/EP additional V pulse circuit

MONITOR CUT

The monitored picture does not appear on the screen during the LP variable speed play in VT-6800.

Fig. 4 shows the monitor cut signal generation circuit.

Monitor cut is done by applying Hi to IC202-pin 23 of the video processing system in this unit, that is, during loading and LP variable speed play.

The loading period (Hi) signal is output from the μP of the system control circuit during loading, and this signal activates Q305. As a result, Q304 is cut off and the monitor cut (Hi) signal is applied to pin 23 via D214.

The SPEED PLAY (Lo) signal is applied to D303 from the μP during LP variable speed play. Both anodes of two diodes D302 are set to Lo. By this, Q304 is cut off and the monitor cut signal is applied to IC202.

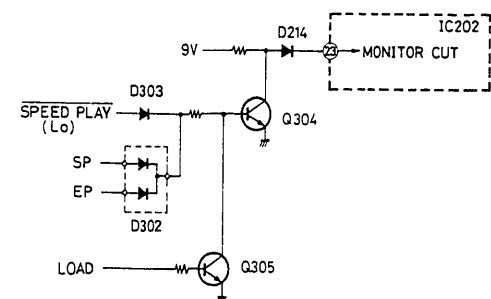


Fig. 4 Monitor cut signal generation

OPERATION WHEN CAMERA IS CONNECTED

The following operations are performed when the VT-6800 is connected to the VK-C850. The record check function among these operations is the new feature.

1. When the battery voltage drops, the "B" lamp lights in the electronic viewfinder by the overcharge detection signal (ODC).
(Overdischarge detection)
2. In the record mode, the VTR enters the power save mode by the stand-by switch operation when battery power is used, and enters the record pause mode when adapter power is used, making the camera pause switch ineffective. (Stand-by operation)

3. The VTR enters the record pause mode when the record operation is performed. Pause control of the VTR is possible from the camera pause switch alone.
(Camera pause)
4. When the record check button of the camera is pressed in the record pause mode, the recorded material is played back for approx. 3.5 sec in the reverse (rewind) direction at the same speed as in the record mode, and played back for approx. 2.5 sec in the forward direction. Phase matching is done after playing back the tape and then the unit enters the record pause mode.
(Record check)

[Overdischarge detection]

When the battery voltage drops to approx. 11.2V when the VTR is operated with the battery, the overdischarge detection circuit in IC803 feeds the ODC (2V) signal to pin 9. This signal is sent to the camera from pin 5 of the camera jack to light "B" in the viewfinder. When the voltage later drops to approx. 10.5V, the VTR is turned off and the power to the camera is also shut off. Replacement or charge of battery is required after "B" is lit.

The overdischarge detection circuit compares the power voltage applied to IC803-pin 1 and the overdischarge detection level applied to pin 5.

The voltage of pin 1 is the battery voltage with the drop component of D821 deducted, and the voltage of pin 5 is the overdischarge level set from the μ P 5V power supply. As a result, when the battery voltage is set below 11.2V, the input values of pins 1 and 5 invert, so the internal detector outputs Lo. This causes the inverter in the next stage to output ODC Hi (2V output). This "Hi" output is sent to the camera through the camera jack.

[Camera pause]

When the record operation is done in the recording mode using a camera, the VTR enters the record pause mode. All the pause operations during record are controlled from the pause switch on the camera.

D814 is biased to Hi by the switch built-in the camera jack when the camera is connected. So, IC801 is set to Hi, and input from the pause switch of the VTR during the record mode is inhibited.

Pin 4 of the camera jack is set to Lo during recording, to effectuate the pause switch operation. That is, when the pause switch is operated in the record mode, pin 6 of the camera jack is set to Hi to apply PAUSE operation and to Lo to release PAUSE operation. By this, pin 19 of the μ P is set to Lo during the camera pause mode and the μ P controls the VTR to enter the pause mode. Pin 19 is set to open when pause is released to control the VTR to release the pause operation.

Pause polarity select switch

A pause polarity select switch is provided on the camera pause control line. This switch is used to select the type of camera pause output of the camera used. Set this switch to (+) with a Hitachi camera, because the camera pause output is Hi. Set it to (-) when a camera with the camera pause output set to Lo is used. The camera pause control signal with the same level can be transmitted from the camera to the system control μ P by this switch operation.

[Stand-by operation]

When the stand-by/operate switch of the camera is set to "STAND-BY" during recording, the VTR enters the power save mode and reduces the power consumption to approx. 1/5 when the battery is used. (The pause indicator flashes and the capstan and cylinder motors stop).

When the adapter power is used, the VTR simply enters the record pause mode. However, this pause mode cannot be released by operation of the pause button on the VTR.

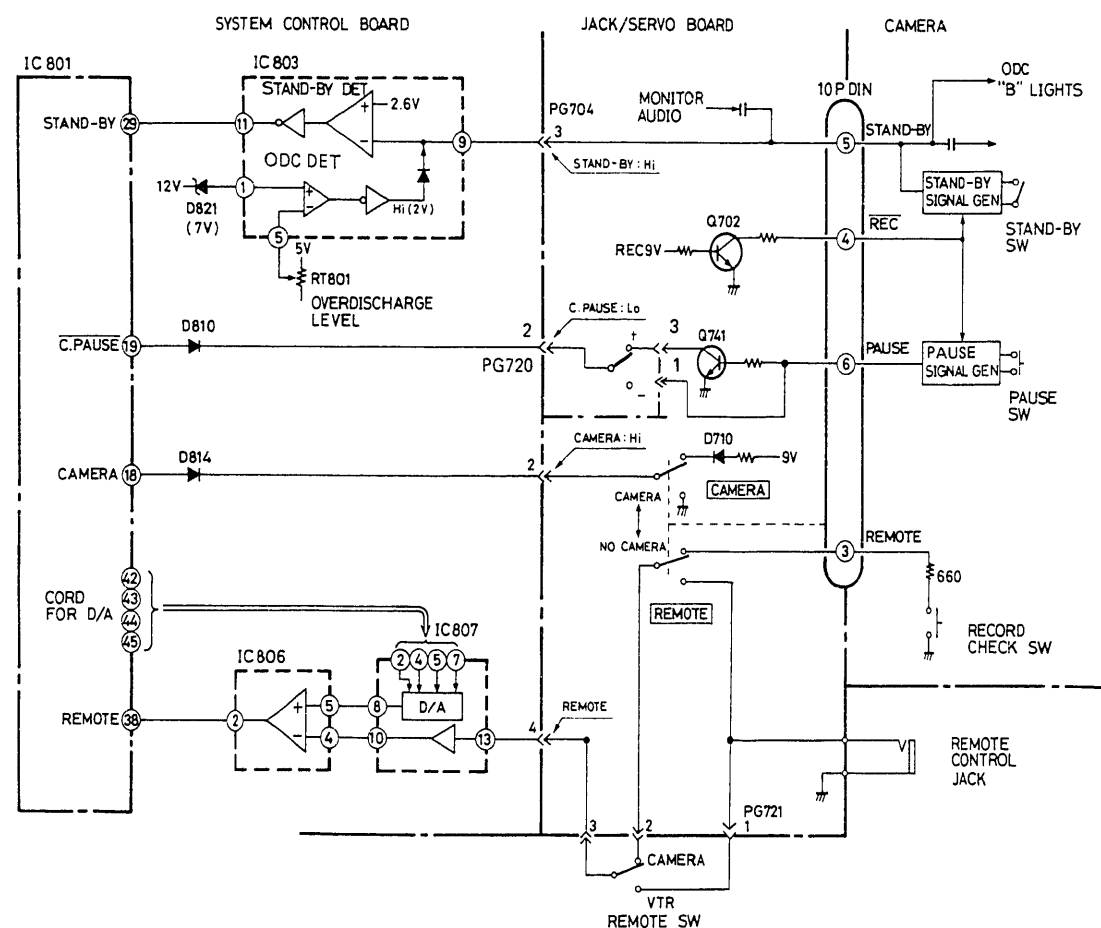
Q702 is activated and applies Lo to the stand-by signal circuit via pin 4 of the camera jack in the record mode. When the stand-by switch is set to "STAND-BY", "STAND-BY: Hi" is output from pin 5 of the camera jack and is supplied to the stand-by detection circuit in IC803. The stand-by detection circuit detects it and outputs Lo. As a result, pin 29 of IC801 (μ P) is set to Hi, which controls the system so that the VTR enters the record pause mode when the tuner/adaptor power is used.

[Record check]

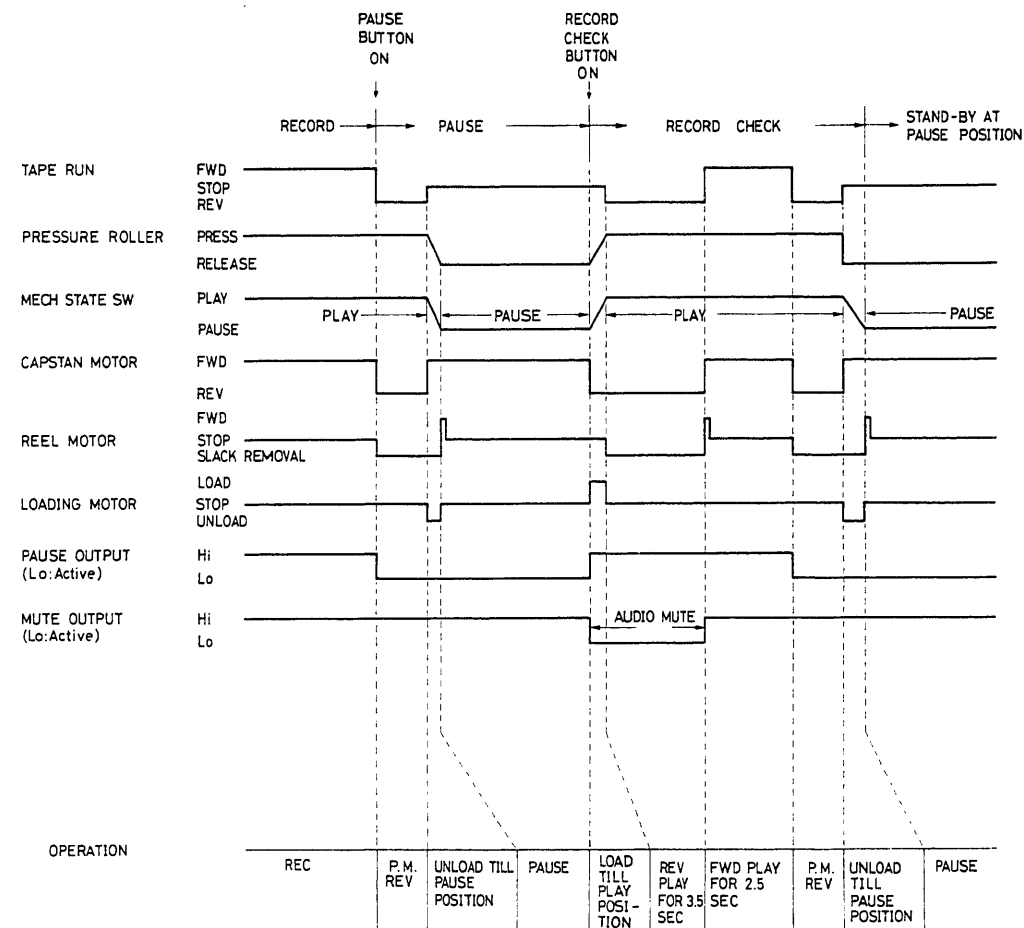
This is the function to playback a little of the recorded material in the rewind direction to check whether or not recording is done when the pause operation is performed in the record mode.

The remote switch of the camera is changed over to "CAMERA" to perform the pause operation when recording with camera. When the record check button is pressed during the record pause mode, the VTR performs reverse play at the same speed as in the record mode. Forward play is done for approx. 2.5 sec in sequence with reverse play for approx. 3.5 sec. When the forward play is finished, rewind operation for phase-matching is done and the VTR enters the record pause mode.

The record check is as shown in the timing chart below.



Control lines formed when camera is connected (camera stand-by, camera pause, record check)



Timing chart for record pause, record check

When this remote switch is set to "CAMERA" when the camera is connected, it passes the record check input from the camera, and when it is set to "VTR", it passes the remote control input. The remote switch selects the remote control input whichever side it is set, when the camera is not connected.

When the output of the remote switch is supplied to IC807 and the level is detected, it is input to pin 38 of the μP to make it operate as specified.

Viewing the record check level as an analog level, it is equivalent to 660 Ω in the remote control input. So, 660 Ω is connected in the camera by the record check button operation to obtain the record check signal.

That is, when the record check signal is input to the μP , the

loading motor is driven to compress the pressure roller against the capstan. Next, the capstan turns in reverse and performs reverse play.

The tape is taken up by the reel motor at this time. The audio system is muted during reverse play. The capstan motor turns normally after reverse rotation to perform playback. The capstan motor turns in reverse for phase-matching after forward play to rewind the tape for approx. 15 mm, and it returns to normal rotation. The loading motor turns in reverse to release the pressure roller from the capstan.

The record check input is in parallel with the remote control input and changed over by the remote switch.

SIGNAL SELECTION

The signal select circuit is positioned at the jacks of the audio system and video system; it transmits the TV signal from the tuner and the audio/video signals from the camera and the line jacks to the audio board and YC board during recording, and changes over the signal route so that the signals can be sent to either of the above circuits, to feed back the signals to the RF converter, line jacks or camera during play.

The figure shows the signal select circuit.

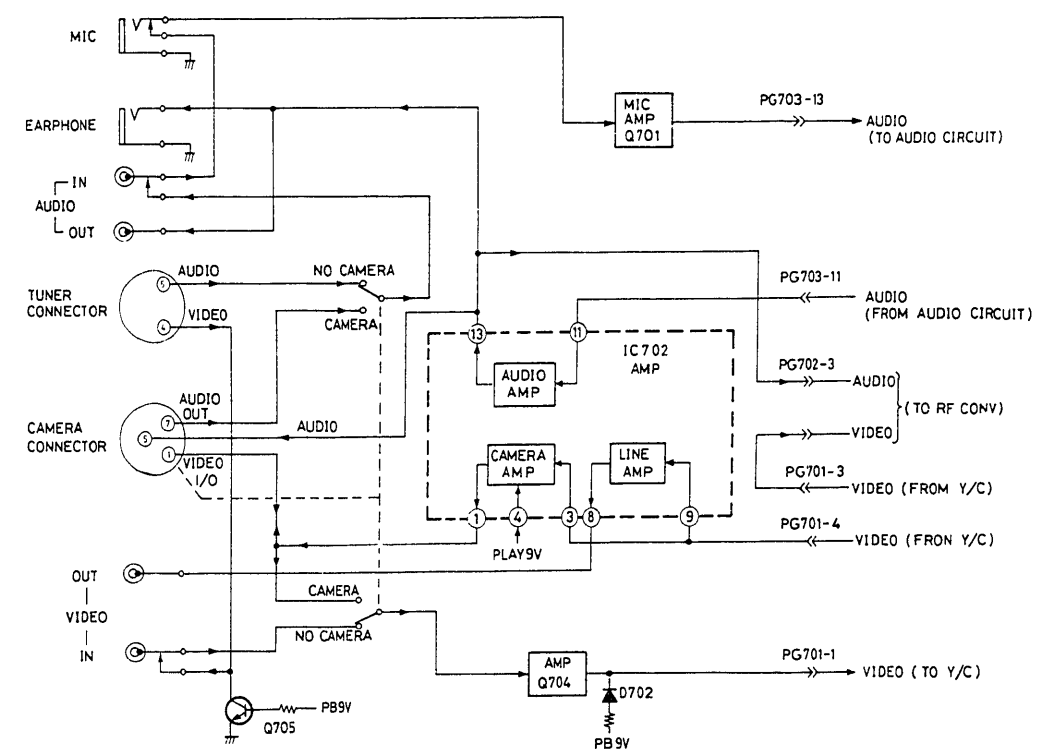
The select circuit is composed of IC702, the switch with a built-in jack and the switch with a built-in camera jack. IC702 incorporates the video signal play amplifier, audio signal play amplifier and the camera amplifier. Only the camera amplifier is operated by "PLAY 9V" input from pin 4.

Tuner signal selection

When VT-TU68 is connected to the VTR, the audio signal is applied to the VTR from pin 4 of the 10P DIN jack, and the video signal, from pin 6 during recording.

The audio signal which passes through the line jack and microphone jack is amplified by the microphone amplifier Q701 and is supplied to the audio circuit as the signal to be recorded. The video signal sent from the line jack is amplified by the video amplifier and is supplied to the YC circuit.

The monitor audio signal is applied to IC702-pin 11 from the audio circuit. This signal is amplified and fed to pin 13. As a result, it can be monitored through the earphone jack. The monitor video signal is previously branched to the RF converter system and the line system on the YC board, and is sent to the signal select circuit via pins 3, 4 of PG701 respectively. This signal is received by pins 9, 3 of IC702 but the camera amplifier terminates pin 1 of the camera connector with 68 Ω , so the only signal input to pin 9 is amplified and is fed to pin 8. This is output from the line jack.



Signal selection circuit

SOUND ON SOUND

Camera signal selection

When VK-C850 is connected to the VTR, the switch with a built-in camera jack is changed over to "CAMERA". By this, the audio system tuner output, video system line input and tuner output are switched out of the circuit and the signal sent from the camera is applied. The audio signal appears at pin 7 of the camera connector and the video signal appears at pin 1, and they are sent to the audio circuit and YC circuit in the same way as with the tuner signal.

The video signal system has only one line in VK-C850, so pin 1 of the connector is used as the common terminal for signal input/output. As a result, the recorded video signal cannot be monitored with the viewfinder of the camera.

The monitor audio signal appears at IC702-pin 13 and, when the camera is connected, it is returned to the camera via pin 5 of the camera connector, to monitor from the camera using an earphone.

The monitor video signal is same as when the tuner is connected. Monitoring through the viewfinder of the camera is playback monitor; the signal applied to IC702-pin 3 during playback is amplified by IC702 and output to pin 1, then it is fed back to the camera via pin 1 of the camera connector.

This is the function to dub an audio signal over the previously recorded signal without erasing it.

The sound-on-sound recorded section can be heard mixing with the previously recorded narration or music.

[Operation]

Set the unit to the dubbing pause mode at the start of sound-on-sound recording. Set the sound-on-sound switch to ON.

Press the pause button to release the pause mode. (Sound-on-sound mode)

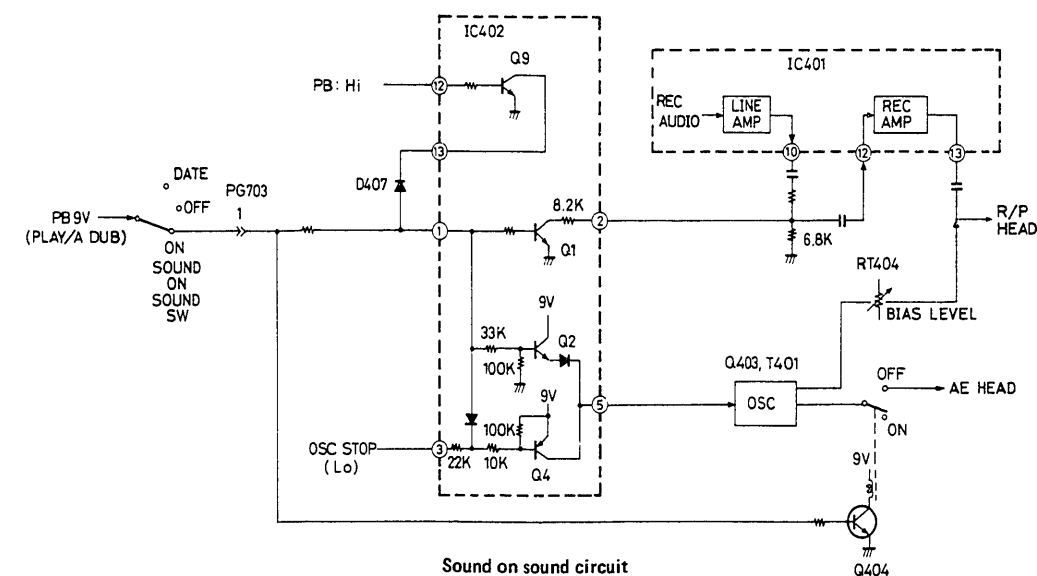
Perform the pause or stop operation to interrupt or stop the sound-on-sound mode.

The record bias current is suppressed and the record level is lowered to record the audio signal on the recorded section without erasing it in the sound-on-sound mode. The audio erase head is switched out of the circuit.

The figure below shows the sound-on-sound circuit.

When the sound-on-sound switch is set to ON, PB9V transmits the sound-on-sound signal to the audio circuit via the switch. This signal is applied to IC402-pin 1 to change over the bias oscillation power voltage. That is, the bias oscillation power circuit during recording and dubbing is Q4; Q4 is cut off by the sound-on-sound signal to change it over Q2. The sound-on-sound signal activates Q404, drives the relay and switches the audio erase head out of the circuit.

During play, PB9V sets the sound-on-sound signal line to Lo via D407 using IC402-pin 13 so that the signal does not operate the circuit.



VIDEO DUBBING (INSERT)

The figure below shows the video dubbing (insert) circuit. "Insert" is a function to dub only the video signal again to part of the record tape without erasing sound.

[Operation]

Rewind the tape up to the record start section when recording the title, etc. on a recorded tape.

Set the VTR to the record pause mode.

Press the INSERT button. (Insert pause mode)

Press the pause button, or press the camera pause button when the camera is connected, to release the pause mode. (Insert starts).

Press the stop button so that the unit enters the stop mode when recording is completed. (Memory stop is possible with the memory counter set to "0000" at the position where it is desired to stop and the memory switch set previously).

Tape transport is done at the same speed as in recording to match the phases of the previously recorded section and the section to be inserted, in the INSERT mode. This causes noise at the joint to be reduced. As the previously recorded section is not erased by the erase head, but it is erased by the dubbed insert signal, the record current in the insert mode is increased to be much higher than in the ordinary record mode to reduce remaining noise.

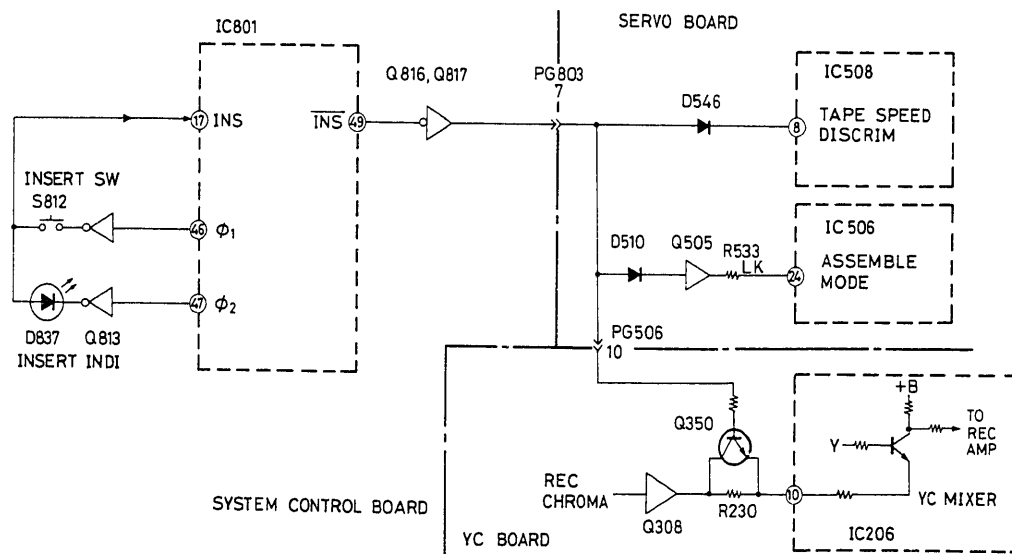
When the INSERT switch S812 is pressed in the record

pause mode, the insert mode is input to IC801-pin 17. This causes the VTR to enter the insert pause mode, and the insert indicator lights. The insert pause mode transfers to the insert mode by operating the pause button. When the insert mode is entered, the "OSC STOP" pin is set to Hi to stop the bias oscillation of the audio circuit. Also, pin 49 is set to Lo to set the servo system and YC system to the insert mode.

Pin 8 of the auto tape speed detection circuit IC508 is set to Hi via D546 in the servo system. This causes the tape speed during the insert mode to be equal to the tape speed in the previously recorded section.

Q505 is activated via D510 and pin 24 of the servo circuit IC506 is grounded via R533. By this, phase matching (assembly mode) between the sync signal of the inserted record signal section and the CTL pulse of the previously recorded section is done during the insert mode to make the joint between the previously recorded section and the inserted section inconspicuous, and play servo is applied to the capstan motor and record servo to the cylinder motor during the insert period.

With the YC system Q350 is activated, R230 is short-circuited, the emitter resistance of the YC mixer IC206 decreases and the gain of the Y signal and C signal in the YC mixer increases.



Video dub (INSERT) mode

REEL MOTOR/LOADING MOTOR SHORT-CIRCUIT DETECTION

When the reel motor and loading motor are short-circuited, the drive circuit could fuse. If motors are short-circuited, it is detected and the power switch is turned off, to prevent this. The power switch operation is not accepted when the motors are short-circuited.

The state hold circuit of the power switch activates the transistor in IC802 using a DC voltage obtained by rectifying the $\phi 2$ pulse output from the μP which sets IC802-pin 2 to Lo to change over the power switch relay (ON operation). When the motor short-circuit detection circuit detects a short-circuit, it absorbs the DC obtained from the $\phi 2$ pulse to cut off the transistor in IC802 and change over the power switch relay to OFF.

Data on the loading motor is noted outside (), and the data on the reel motor noted inside ().

The short-circuit detection circuit grounds pin 4 (5) and pin 12 (12) which are the common potential of the loading motor (reel motor) drive circuit via a 0.5Ω resistor, and activates Q923 (Q924) by means of the voltage generated here when the motor is short-circuited, to cut off the transistor in IC802.

SWITCHING REGULATOR

The switching regulator is used to improve the power consumption efficiency to obtain a 5-way power system (5V, 9V, M9V, $V_{CAPSTAN}$, $V_{CYLINDER}$) from the 12V power supply of the battery or tuner/adaptor. $V_{CAPSTAN}$ and $V_{CYLINDER}$ are optimized according to the load and the rotation speed of the capstan motor and cylinder motor, to improve the power conversion efficiency.

This switching regulator incorporates the power save function, and power supplies other than 5V do not work during the power save mode.

Fig. 1 shows the switching regulator and peripheral circuits. 5V system

System control circuit μP power supply.

9V system

VTR main power supply.

M9V system

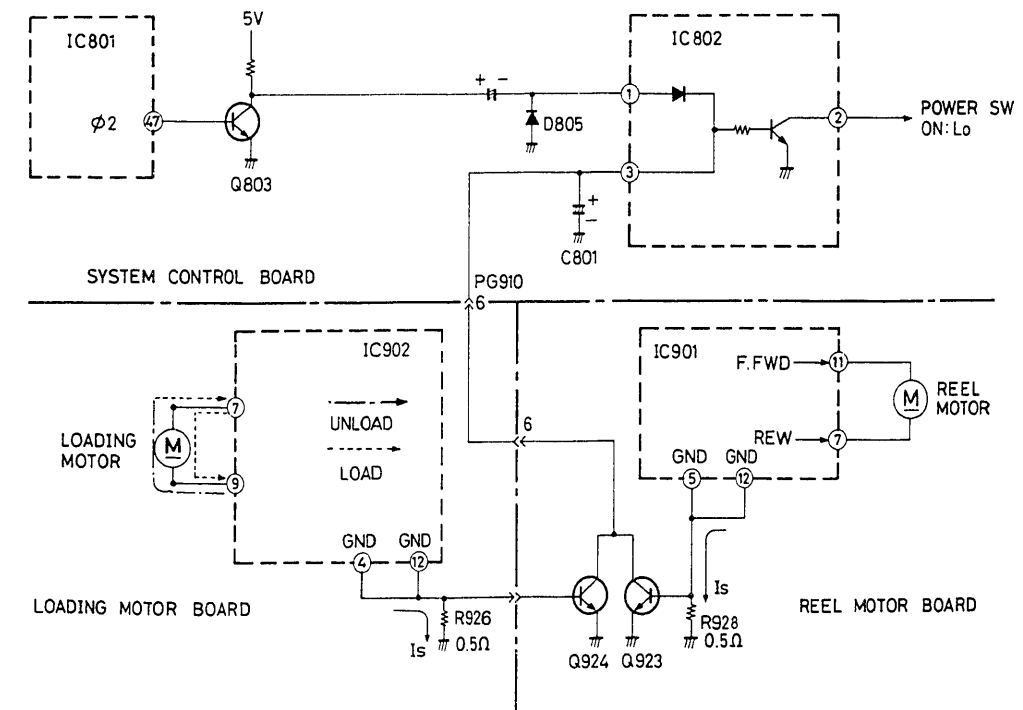
Reel motor and loading motor power supply. This is derived from the 9V system.

V_{CYL} system

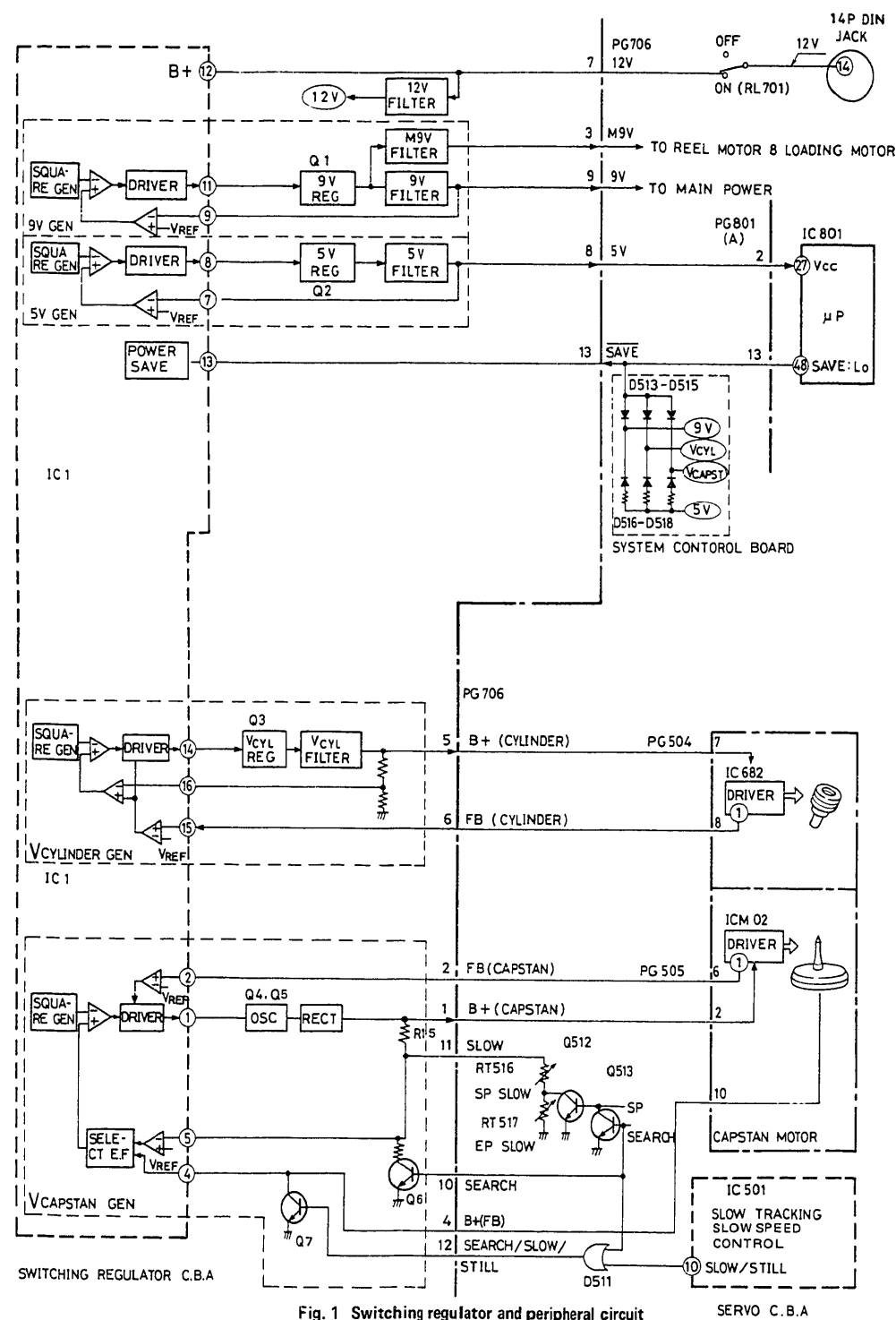
Cylinder motor power supply. This varies in the range of 0V - 12V according to the cylinder motor load and speed.

$V_{CAPSTAN}$ system

Capstan motor power supply. This varies in the range of 0V - 20V according to the capstan motor load and speed.



Motor short-circuit detection circuit

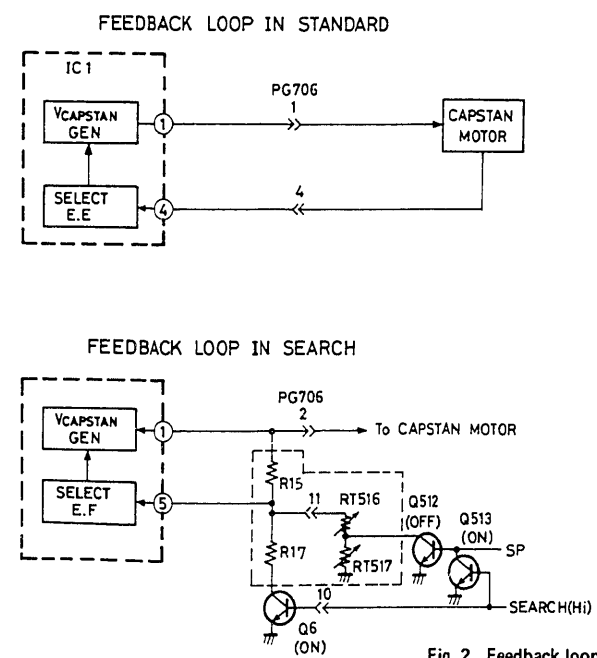


The switching regulator is composed of the rectangular wave generators and the comparators. The reference voltage and output voltage are compared by the comparator, and the duty of the square output is controlled by this compared output. This square output is rectified to obtain the DC voltage.

For power control of the equipment the load condition of which changes the cylinder motor or capstan motor, feedback from the motor drive circuit is applied to the regulator to adjust the output voltage according to the increase/decrease of the load. In addition, the capstan motor is provided with the select circuit which changes over the modes between the search, still, slow play, etc. and the standard play to control the appropriate output.

The output of the capstan motor is changed over by the select circuit built in the switching regulator in 4 stages - during the standard play mode, search mode, SP slow mode and EP slow mode. This select circuit selects the input of pin 4 or pin 5 of IC1. The input of pin 4 is the feedback input during the standard record or play mode, and the input of pin 5 is the feedback input during the slow and search modes. In addition, the feedback amount of the input of pin 5 is changed over in the search, SP slow and EP slow modes.

Fig. 2 shows the feedback loop in each mode.



In the standard record or play mode, since Q7 is cut off, the feedback from the capstan motor is applied to pin 4 to control the output voltage.

In the search mode, Q7 is activated and the input of pin 5 is selected. Q6 is activated and Q512 is cut off, so the feedback amount of pin 5 is determined by RT516, RT517, R17 and R15. In the SP slow mode, Q7 is activated and the input of pin 5 is selected. Q512 is activated, so the feedback amount of pin 5 is determined by RT516 and R15.

In the EP slow mode, Q512 is cut off and the feedback amount of pin 5 is determined by RT516, RT517 and R15.

Power save

This is the power save function to stop the power supplies other than the 5V system in the switching regulator. When IC1-pin 13 is set to Lo, the VTR enters the power save mode. Power consumption becomes approx. 1/5 in the power save mode. The power save operation is done in the following cases by the instruction transmitted from the system control circuit.

- o When the record pause mode continues for 5 minutes using the battery power.
- o When the power save switch of the camera is operated during recording from the camera using battery power.

The record and play indicators light and the pause indicator flashes to indicate the power save mode:

Power short circuit detection

The short-circuit detection circuit is provided for the power supply of the 9V system, V_{CYL} system and $V_{CAPSTAN}$ system so that the unit enters the power save mode to stop the output when a short-circuit occurs. The power save mode is released when the short-circuit is released. The power save mode is released when the short-circuit is released. D513, D514 and D515 are connected to the power save pin and 9V, V_{CYL} and $V_{CAPSTAN}$ are reversely biased. Because of this, the unit enters the power save mode when either of lines is short-circuited. Each line is reversely biased by the 5V via D516, D517, D518, so when the short-circuit is released, the power save line is set to Hi, and the power save mode is released.

SERVO CIRCUIT

OUTLINE

When recording, the servo circuit should cause the tape to run at a constant speed of 3.335 cm/sec in the SP mode and 1.112 cm/sec in the EP mode and the video head (upper cylinder) to turn at precisely half the period of the sync signal component of the video signal to be recorded. In addition, it should keep the relative positions of the head and the tape constant so that the vertical blanking period is recorded at the lower side of each track on the tape. During play, the servo circuit should maintain the same tape speed as during recording and turn the video head precisely at the frequency of 30 Hz; in addition, it should make the head trace the recorded video tracks precisely. Phase control and speed control are applied to the capstan motor and cylinder motor to do the above. The phase control system performs control against minute changes, and the speed control, against large changes. The capstan motor keeps the specified tape speed by means of these 2 pairs of control, and the cylinder motor, because these controls suppress the wow and flutter during the load change and during start, rotates at a constant speed. Fig. 1 is a schematic diagram of the capstan servo and the cylinder servo and the signal system.

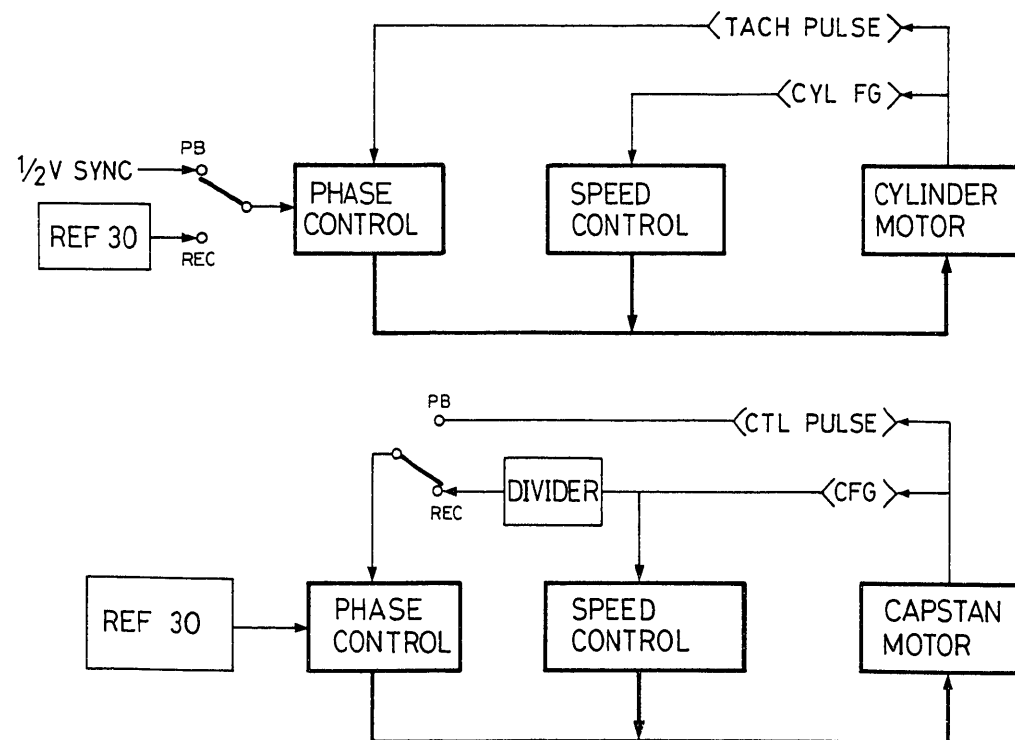


Fig. 1-a Servo system schematic and signals (I)

1. SIGNALS IN SERVO SYSTEM

The speed control system and the phase control system of the servo circuit operate precisely by means of the following 7 types of signal.

1. 1/2V SYNC

This is the signal obtained by dividing the vertical sync signal in the video signal into 2; it performs phase control of the cylinder motor by phase-comparison with the cylinder tach pulse (described later).

2. REF 30 Hz

The 3.58 MHz signal obtained in the chroma signal control system is divided by 119318 to make it 30 Hz, and it is called the reference 30 Hz signal (REF 30).

This signal performs phase control of the cylinder motor by phase-comparison with the cylinder tach pulse during play. This is used as the reference signal for phase-control during both recording and playback, in the same way.

3. CYLINDER TACH PULSE (CYL TACH PULSE)

This is a positive pulse with a frequency of 30 Hz, and is generated by the magnet on the disk installed at the bottom of the cylinder motor shaft and the head installed to the chassis. It is used for detection of the motor speed and the video head position.

The cylinder motor phase control is done by phase-comparison with the 1/2V sync and REF 30 described above.

4. CYLINDER FG (CYL FG)

This is a pulse with a frequency of 120 Hz, and is generated by the 8-pole magnet installed in the rotor of the cylinder motor and the stator coil. This controls the cylinder motor speed during both recording and playback.

5. CAPSTAN FG (CFG)

This CFG is produced by the 480-pole gear installed in the capstan motor rotor and the stator gear. The capstan changes the tape speed according to the recording time mode, so the frequency is 720 Hz in the SP mode, and 240 Hz in the EP mode. This performs phase control of the capstan motor by phase-comparison with REF 30 during recording. It also performs speed control during both recording and playback.

6. CTL PULSE

This is a bipolar pulse with a frequency of 30 Hz. The control head picks up the pulse recorded at the bottom of the video tape (control track) during playback. The CTL pulse is the vertical sync signal divided by 1/2 and recorded on the control track during recording; the capstan motor is phase-controlled by phase-comparison between this pulse and REF30 during playback.

MOTOR	CONTROL SYSTEM	MODE	REFERENCE SIGNAL	COMPARISON SIGNAL
CYLINDER (VIDEO HEAD)	PHASE	REC	$\frac{1}{2}$ V. SYNC	CYLINDER TACH PULSE (30Hz)
		PB	REF 30	
	SPEED	REC & PB	CYLINDER FG (120 Hz)	
CAPSTAN	PHASE	REC	REF 30	CAPSTAN FG (CFG) (30Hz by 720Hz in SP) (dividing 240Hz in EP)
		PB		CTL PULSE
	SPEED	PEC & PB	CAPSTAN FG (SP: 720Hz) (EP: 240Hz)	

Fig. 1 Servo system schematic and signals (II)

7. CLOCK PULSE

This is used to detect the phase difference obtained from each control system in the digital servo system, using digital values. The pulse obtained by dividing the 3.58 MHz signal sent from the chroma signal control system to 1/8 and set to 447 kHz is used as the clock pulse.

2. DIGITAL SERVO SYSTEM

The control data is digitally processed in the digital servo system, so it is superior to the analog servo system in the following points.

- 1) Variations of the operation point caused by power fluctuations and thermal changes are eliminated.
- 2) Noise has little effect.
- 3) Changing over control gain, phase relation, etc. is easy.
- 4) There are few externally attached parts such as capacitors, etc. and large-scale integration is possible.

The phase difference between the reference signal and the comparison signal is detected as a number of clock pulses, a pulse group with a pulse width proportional to this number (called data) is generated (PWM: pulse width modulation), and this is converted to the DC voltage to be the control output. The basic control route is same as that with the analog servo system. Fig. 2 is a basic block diagram of the servo system. The signals are compared digitally in the digital servo system and clock pulses are used, so the counter circuit, latch circuit and PWM circuit, etc. are newly used in place of the conventional trapezoid wave generator and the sample hold circuit.

The digital servo element HA11727 (pin specifications of this IC are shown on page 83) incorporates the cylinder motor phase control system (PHASE CONTROL), capstan motor phase control system and speed control system (SPEED CONTROL). The cylinder speed control system is composed of a hybrid IC.

CYLINDER SERVO

Speed control

Fig. 3 is a block diagram of the cylinder speed control system. The cylinder speed control system is built in IC502; this adds the control amount detected by the CYL FG 120 Hz pulse to the control amount obtained by phase-control and supplies it to the cylinder motor.

The sawtooth wave and the trigger pulse are produced from the pulse obtained by shaping the CYL FG pulse, and the control amount sampled by this is supplied to the cylinder motor.

CYL FG is applied to IC502-pin 9 and shaped. The pulse obtained here is shaped to the trigger pulse and supplied to the sampling circuit in the next stage.

At the same time, the sawtooth wave is generated at IC502-pin 1 by means of the charging/discharging of RT508 and C543 accompanied by the switching of the wave shaper.

This sawtooth wave is supplied to the sampling circuit via the buffer inside IC502. This causes the sampling voltage to be generated in C544 for every period of the trigger pulse.

This voltage is limited to less than 5V by D539, and is applied to IC502-pin 12 again via the switch between IC506 pins 7 and 6. This is applied to the phase control output inside IC502 and sent to the cylinder motor.

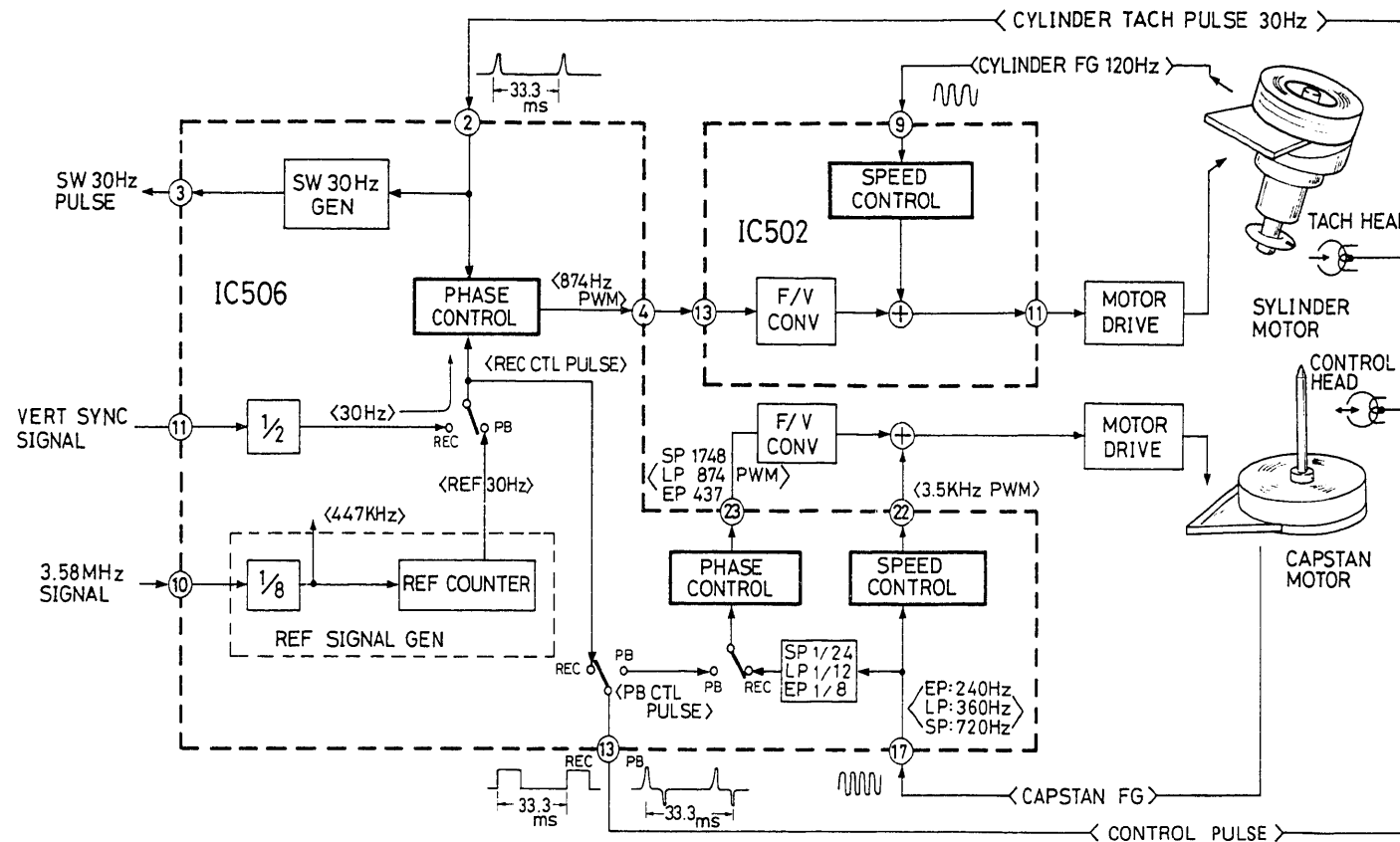


Fig. 2 Digital Servo system

Sampling operation (Refer to Fig. 3-b SAMPLING ACTION OF CYLINDER SPEED CONTROL.)

When the cylinder load increases and speed decreases a little, the frequency of FG drops and the wavelength is increased. As a result, the inclination of the sawtooth wave is reduced and the sampling voltage rises. That is, it works in the direction to speed up the motor's rotation. On the other hand, when the rotation speed increases, the frequency of FG gets higher. It works in the direction to slow down the motor's rotation by the reverse process in the case when rotation speed drops.

Motor start and stop

The cylinder start signal "CYL ON" (Hi during recording) which is generated by the system control μP is supplied to the servo circuit during the motor start. The "CYL ON" signal is applied to IC502-pin 6 and Q511. When the "CYL ON" line is set to Hi by this, Q511 is cut off and the 2 switches inside IC506 are set to OFF. As a result, the rise of "CYL ON" is applied to the cylinder motor from IC502-pin 6 and the motor starts.

"CYL ON" is set to Lo during the motor stop operation. As a result, Q511 is activated, and 2 switches inside IC506 are set to ON. By this, the control circuit and the cylinder motor are shut off. At the same time, IC502-pin 1 is set to Lo, the generation of the sawtooth wave stops, the control circuit stops operation and the motor stops.

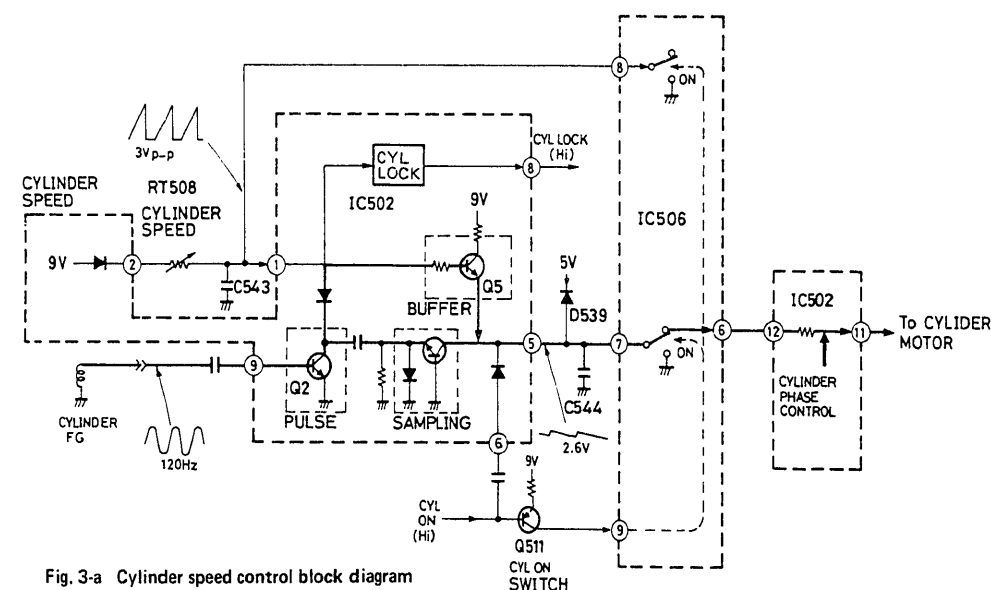


Fig. 3-a Cylinder speed control block diagram

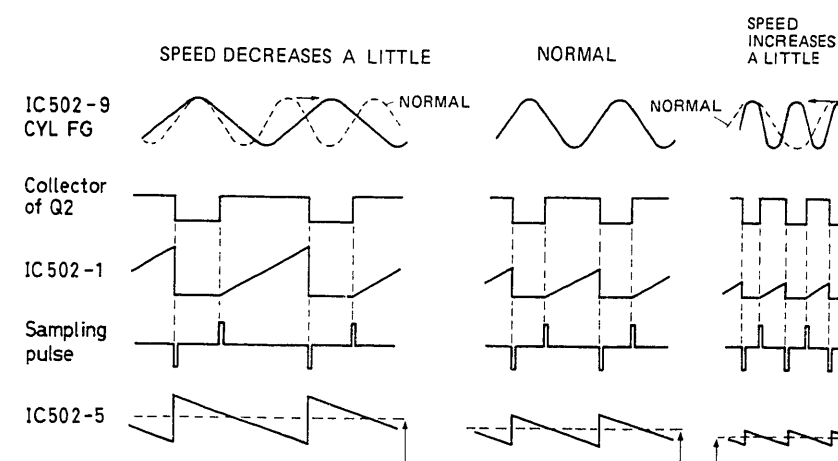


Fig. 3-b Sampling action of cylinder speed control

Phase control

A block diagram of the cylinder phase control system is shown in Fig. 4.

With the cylinder phase control in the digital servo system, the phase difference between the comparison signal; the reference signal is measured by clock pulses, the circulating count data is pulse-width-modulated (PWM) by the data obtained, and it is derived as the control output of IC506. This control output is converted to a DC voltage by the LPF, applied to the output of the speed control system and supplied to the cylinder motor. By this, the cylinder motor rotates at a constant speed (1800 rpm), and precisely performs recording while fixing the vertical blanking period to a specified position. During playback, the specified head traces precisely the specified track.

The tach pulse which is the comparison signal, is applied to IC506-pin 2 and mechanically corrected against the head by the internal monostable multivibrator. By this, the start point of the CH-1 video head is set to 6.5H before the front porch of the vertical sync signal. This amount of delay is determined by the semi-variable resistor connected to IC506-pin 1.

With the 4-head cylinder, the 90° phase difference is present between the SP head and EP head. So, the CH-1 phase control resistors (RT504 for EP and RT505 for SP) are connected in series to pin 1, to correct the switching points in both modes independently.

Adjustment is started at the EP side first.

The clock counter is reset by the delayed clock pulse. The counter starts counting the clock pulse from the trailing edge of the delay tach pulse.

The reference signal is shaped to the trigger pulse by the pulse generator to perform digital phase-comparison with the tach pulse. This reference signal is produced by receiving the vertical sync signal obtained in the video signal system, to IC506-pin 11 and dividing it to 1/2 during recording; during play it is produced by dividing the clock pulse further to 30 Hz. These 2 signals are selected by the switch and input to the pulse generator.

The pulse generator applies the data from the counter which continues counting, to the latch circuit using the latch pulse. The data at that time is the phase difference between the vertical sync and the switching point. The pulse generator generates the clock gate pulse to accurately perform the latch operation at that time. This latch pulse samples the counter data by the reference signal and immediately performs the latch operation within this gate pulse period. This latch data is supplied to the PWM circuit and the PWM signal corresponding to the data is generated.

The 874 Hz circulating counter data is always input to the PWM generator, and the PWM signal is generated by modulating this circulating data by the latch data. The output

of the PWM generator is observed at IC506-pin 4, and it is sent to IC502-pin 13 for F/V conversion. The PWM wave converted to a DC voltage inside IC502 is added to the speed control output inside the IC and transmitted to the cylinder motor via pin 11.

PWM operation

(Refer to Fig. 4-C CYLINDER PHASE CONTROL.) The duty cycle of the PWM wave is 50% - 50% when the cylinder speed is normal. However, when the load increases and the motor slows down, the reset position of the counter is delayed. As a result, the latch data decreases and the duty cycle of the PWM wave is set to 50% or more (pulse width increases). When this is F/V-converted, the DC level rises and the phase of the cylinder motor is advanced. When the load decreases and the motor speeds up too much, the motor speed is reduced by the reverse procedure.

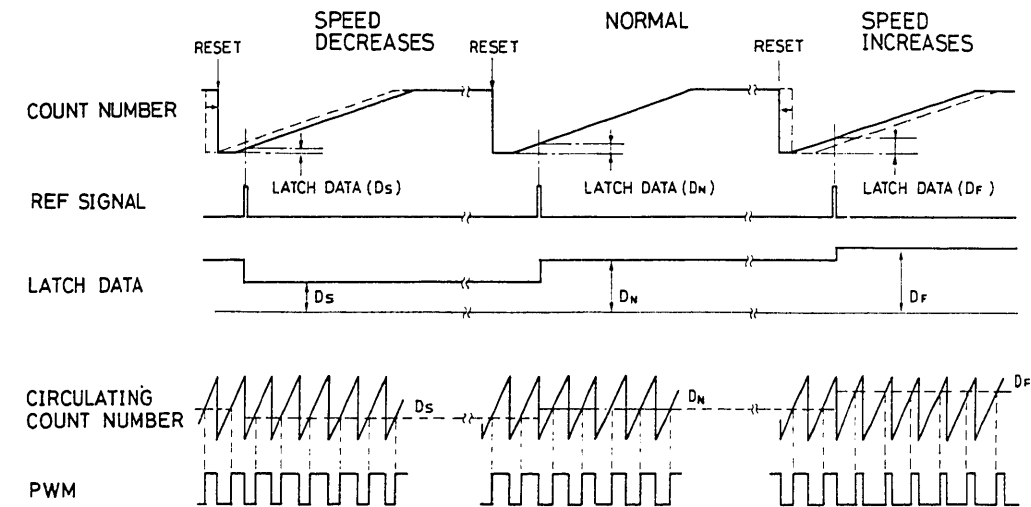


Fig. 4-c PWM operation of cylinder phase control

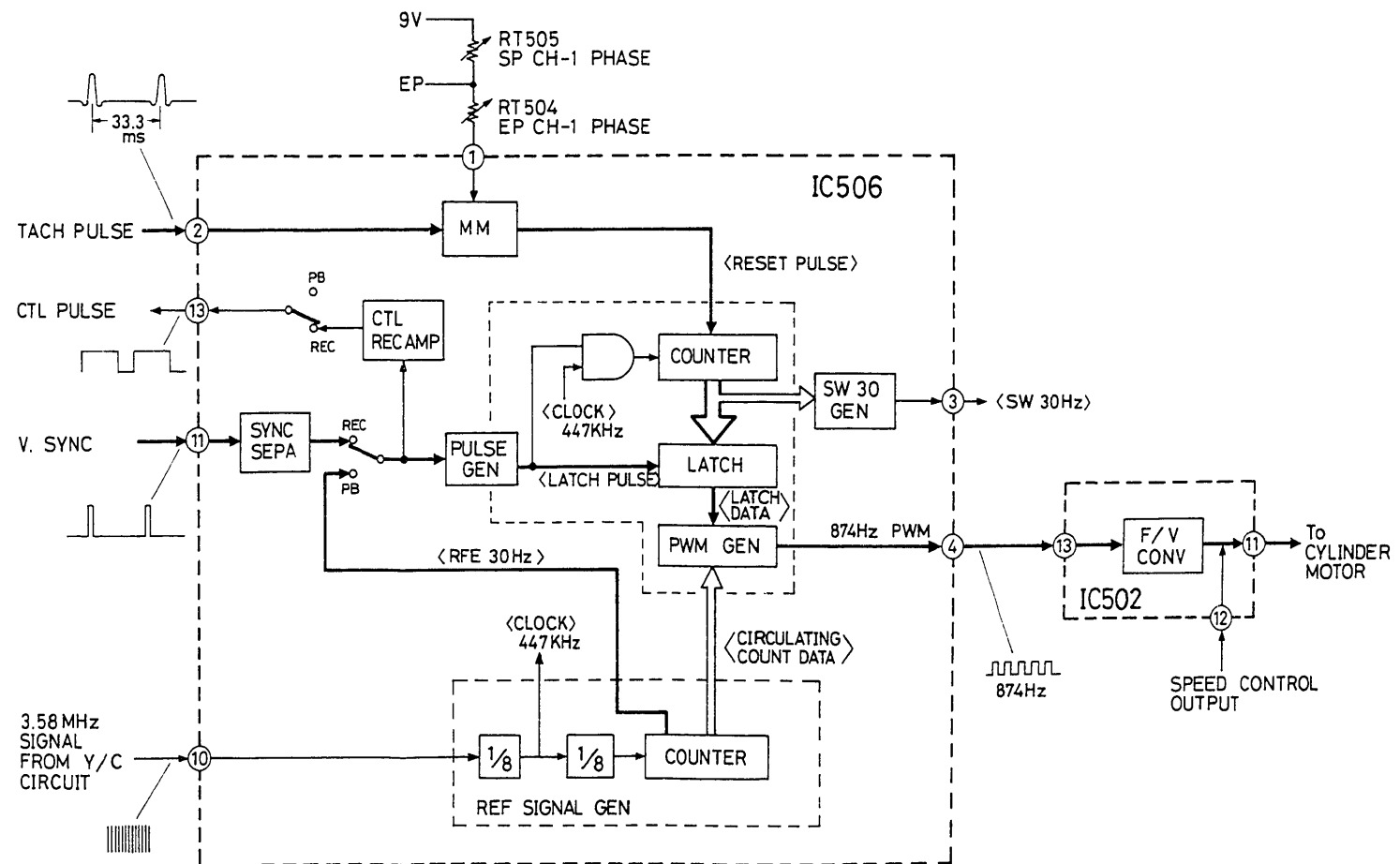


Fig. 4-a Cylinder phase control block diagram

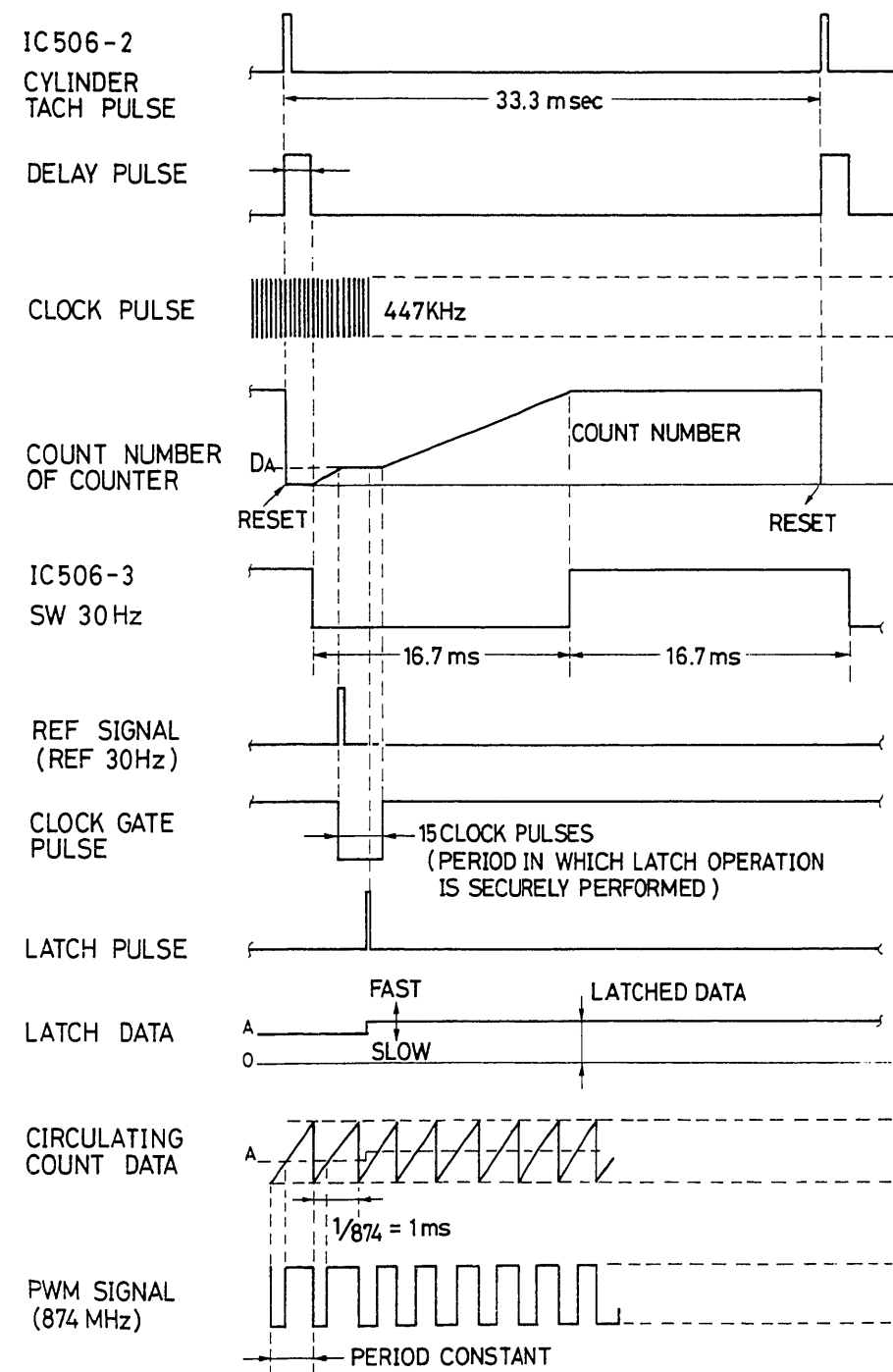


Fig. 4-b Cylinder phase control timing chart

Generation of SW 30Hz pulse

Fig. 5 shows the SW 30 Hz pulse generation circuit. SW 30 Hz which controls the switching point is obtained from the cylinder tach pulse. This tach pulse is delayed by IC506 and becomes the switching pulse on the CH-1 side. This pulse is also used as the clock counter reset pulse in the cylinder phase control system. This counter overflows 16.7 msec after resetting. That is, this overflow point is the switching point of CH-2, and this is input to the SW 30 Hz generator to derive SW 30 Hz from IC506-pin 3.

The pulse obtained here becomes the square wave width duty 50% - 50% in the standard playback mode, but during the visual search mode, the cylinder speed varies, so the duty is not 50% - 50%. As a result, the duty of the pulse obtained at IC506-pin 3 should be made to 50% - 50% during the search mode. IC504 and Q517 do this. IC504 incorporates a delay circuit used for forward search and a wave shaper. Q517 forms a delay circuit during the reverse search mode. The SW 30 Hz pulse can be derived from IC504-pin 8 without any delay during standard playback.

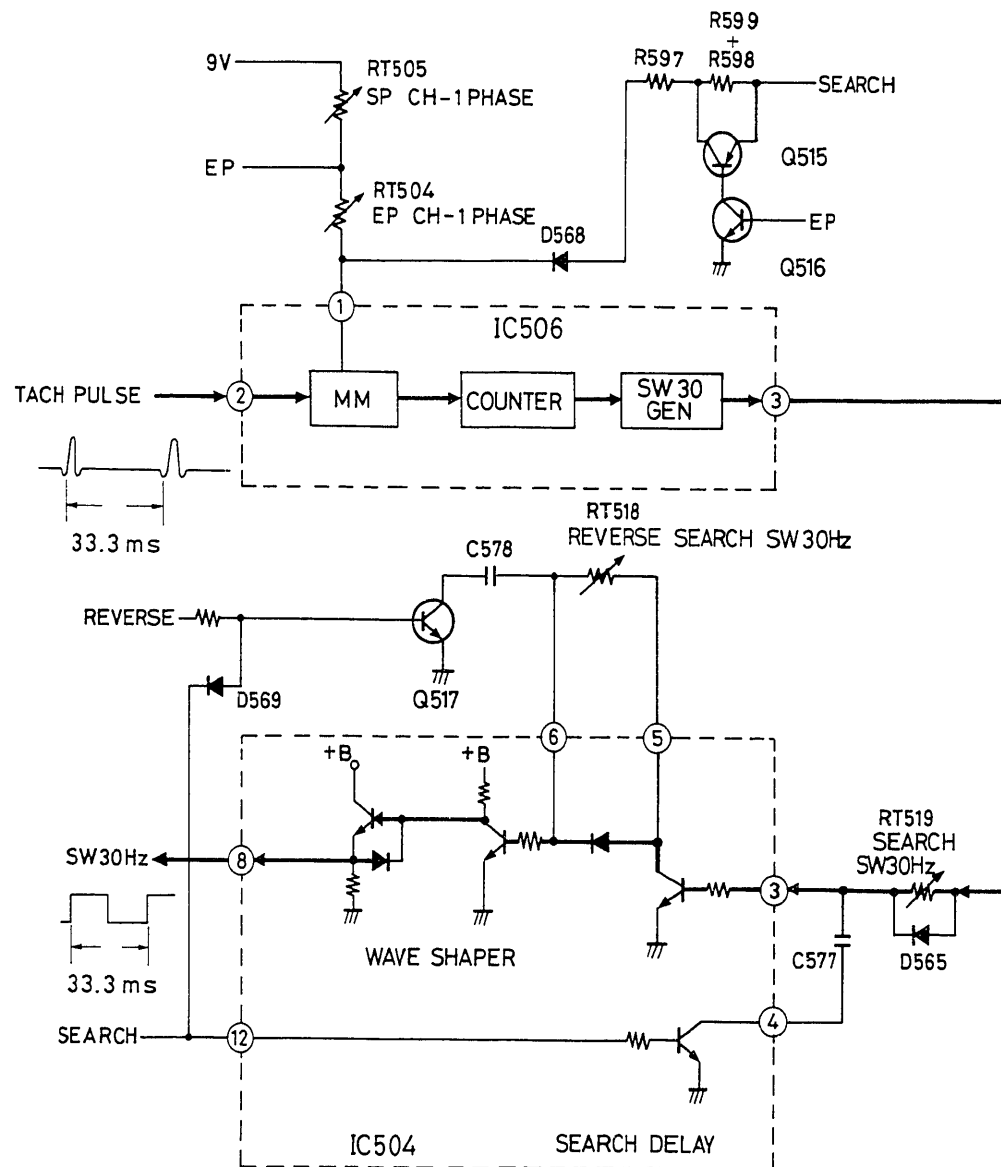


Fig. 5-a SW 30Hz pulse generation circuit

The cylinder speed is increased during forward search, so the period of the tach pulse is shortened. On the other hand, the clock counter of IC506 operates normally, so imbalance occurs between period A and period B shown in the timing chart. This imbalance is cancelled as follows. The "SEARCH" signal is applied to IC504-pin 12 from the system control μ P during search mode. By this, C577 composes the delay circuit with RT519, and perform delay for the amount which equalizes period A and period B. This delay pulse is shaped, and a pulse with duty 50% - 50% can be obtained at IC504-pin 8 even in the forward search mode.

The period of the tach pulse is extended during reverse search. The reverse search delay circuit is coupled in series to the above-mentioned search delay circuit during the reverse search mode. The "REVERSE" signal is further added from the system control circuit in this mode, and is given the correct delay by RT518 and C578. In the reverse search mode, D569 is reverse-biased by "SEARCH Hi" and Q517 is activated by "REVERSE Hi". This causes the delay circuit consisting of RT518 and C578 to be connected.

The delayed pulse is shaped and derived from IC504-pin 8. There is a mechanical difference in the phases of the SP head and EP head in the 4-head cylinder. As a result, when the delay operation is performed by IC504 to produce the SW 30 Hz pulse in the search mode, drift occurs between the phase of SW 30 Hz and the phase of the tach pulse during EP search.

Q516 and Q515 form the circuit to correct the delay of the tach pulse during EP search. R518 is coupled in parallel with RT504 by activating Q515 during EP search; R597, R598 and R599 are coupled in parallel with RT504 by turning Q515 off during SP search, to correct the amount of delay of the tach pulse.

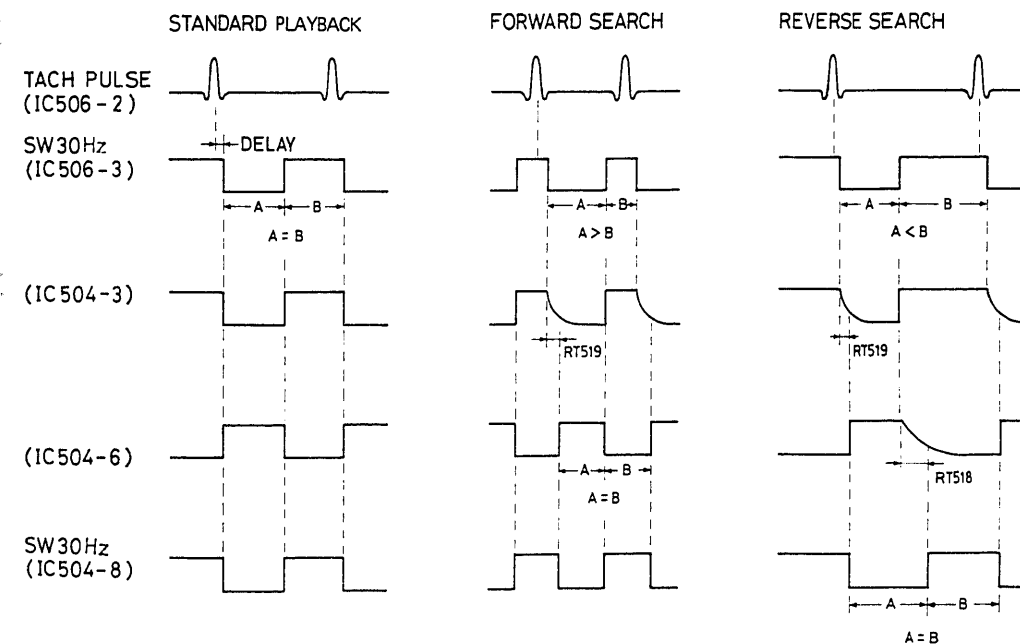


Fig. 5-b SW 30Hz pulse generation timing chart

Recording/playback of control pulse (CTL pulse)

The CTL pulse is the previously shaped and recorded 1/2V SYNC. This is picked up by the CTL head during play, and is used for phase-control of the capstan motor. Because of this control, the capstan enables the specified head to trace the tape in both the SP and EP modes.

The slow X value adjustment arm provided in VT-6500 is not used in VT-6800 and it is treated electronically, so the record/play routes of the CTL pulse differ slightly.

Fig. 6 shows the record/play routes of the CTL pulse.

The 1/2 V SYNC obtained from the cylinder phase control system is shaped and applied to IC509-pin 13 to delay and record it during the record mode. MM4 is a monostable multivibrator which adjusts the phase of the control pulse during the record mode; the control pulse is delayed by parallel connection of R612 and RT520 in the SP mode, and by parallel connection of R613 and RT520 in the EP mode. This delay pulse is shaped to the record pulse by MM5 in the next stage. This MM5 regulates the duty cycle of the CTL pulse to approx. 22 msec by parallel connection of R545 and R544.

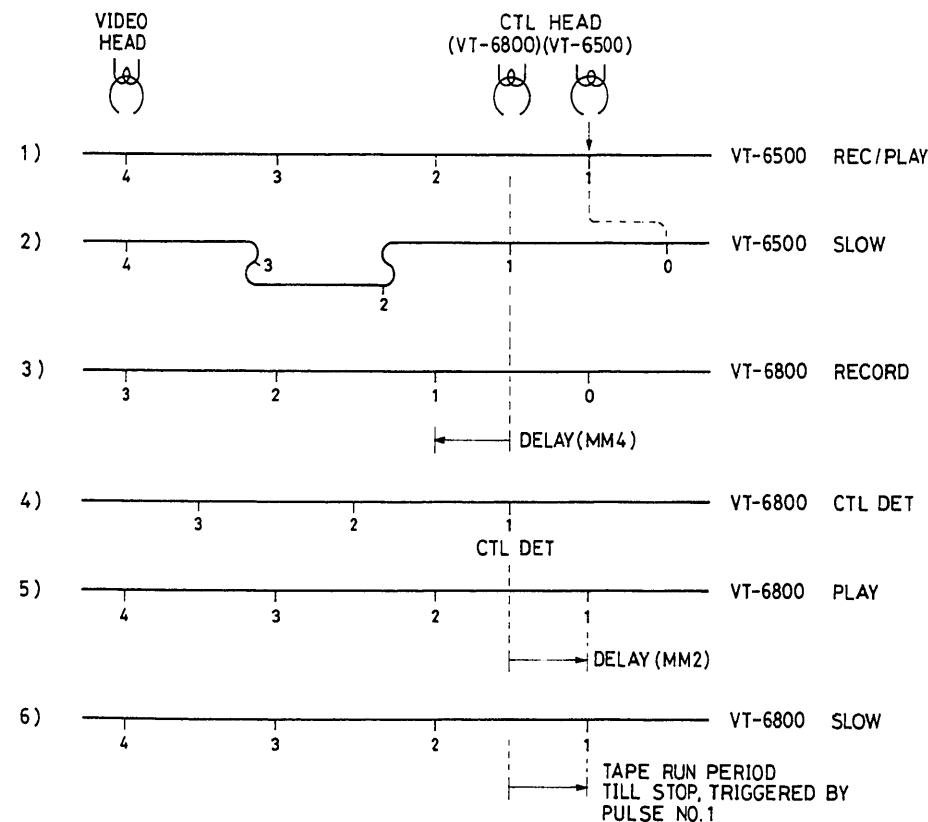


Fig.6-b Delay phase timing chart of CTL pulse.

The pulse detected by the CTL head is amplified by IC507 and sent to IC509-pin 19 during play. The delay to be applied by MM2 to correct the amount of delay applied by MM4 previously is done by the time constant circuit coupled to pin 16 in the standard playback mode. This time constant circuit delays the CTL pulse by $C580/C524 \times R532$ in the EP mode, and by $C524 \times R532$ in the SP mode during the standard playback. The "SLOW STILL" signal ("Lo" during Slow, Still playback) has been applied to R532, so MM2 does not perform the delay operation in the Slow, Still playback mode.

The pulse delayed by MM2 is sent to the tracking adjust-ment circuit. This circuit is composed of MM3 in IC509 and MM in IC506. The tracking preset amount in the EP mode is regulated by MM3 in the former stage and the tracking preset amount in the LP/SP modes, by MM in the later stage.

EP tracking preset is done by RT514 and R584. SP : Hi, LP : Hi are applied to IC509-pin 15 via D553 in modes other than EP and MM3 performs the delay operation by only R584.

The CTL pulse from IC509-pin 13 is applied with tracking preset by IC506. SP/LP tracking preset is performed by RT509. So, preset adjustment is done in the order EP, SP and LP. The CTL pulse obtained in this way is supplied to the capstan phase control system.

The X value adjustment arm used in the Slow, Still playback modes is not used in the VT-6800 and the delay operation corresponding to the operation of the X value adjustment arm is done electronically. Doing this, the CTL head is physically drawn near the video head (X value is made small). However, tapes recorded with the relative position of these heads would not be interchangeable with other VTRs, so the CTL pulse is delayed and recorded at the correct position of the tape.

As a result, tapes recorded by VT-6800 have the same X value, and tapes recorded on other models can be played back on the VT-6800.

Delay phase of CTL pulse

The distance (X value) between the video head and the control head using the tape is shown in Fig. 6b.

(X value is shown as 4 to simplify the description.)

(Refer to (1))

With VT-6500, any delay processing is not applied to the control pulse during recording and play, so the relation between pulses No. 1 and 4 can be maintained.

(Refer to (2))

The X value becomes larger by means of the slow operation arm during slow play. As a result, pulse No. 0 is picked up and this triggers the slow control system, so the STILL timing in the actual slow mode is between pulses No. 0 and No. 1.

(Refer to (3))

The X value in VT-6800 is less than that in VT-6500, so to provide interchangeability with other models, the actual record pulse is delayed so that the X value is equivalent to a value lower.

(Refer to (4))

As a result, the X value of the CTL pulse picked up during play is incorrect.

(Refer to (5))

This is delayed so that the relation between the X values is kept correct.

(Refer to (6))

The CTL pulse is not delayed during slow play in VT-6800, so when the slow circuit triggered by the pulse No. 1 operates, still play operation during the slow mode is done as shown in the diagram.

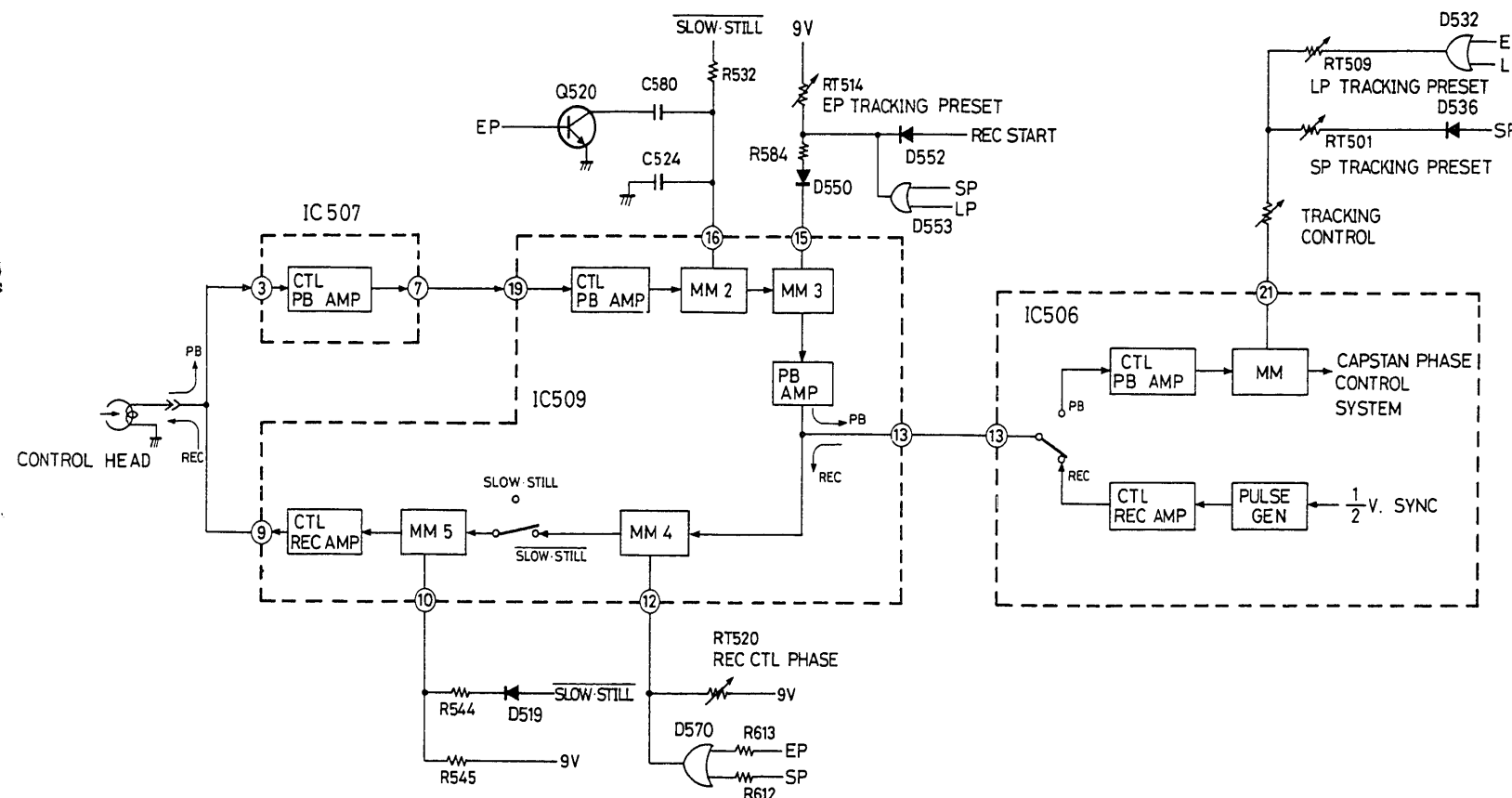


Fig. 6-a Record/Play routes of CTL pulse

CAPSTAN SERVO

Speed control

Fig. 7 is a block diagram of the capstan speed control. The capstan speed control system processes the same signal (CFG) regardless of the record/play modes. It shapes the CFG pulse to reset and set the clock counter, and it performs measurement every period of CFG using the clock pulses. The data thus obtained varies corresponding to the speed of the capstan motor, so the 3.5 kHz PWM wave can be derived from IC506-pin 22 as the speed control output via the PWM generator. This PWM wave is converted to a DC voltage and supplied to the motor to control the motor speed.

The speed control system is mainly composed of the CFG shaping CFG amplifier, the pulse generator which receives the shaped CFG and generates the clock counter resetting pulse and the latch pulse which samples the counter data, the counter which counts the clock pulses during the CFG period, and the PWM generator which modulates the circulating count data output from the reference signal generator using the counter data to generate the PWM signal.

CFG input to IC506-pin 17 is the sine wave (SP: 720 Hz, LP: 360 Hz, EP: 240 Hz), and is pulse-shaped by the CFG amplifier. The shaped FG signal generates the following 2 pulses (*-1) from the pulse generator.

- o Reset pulse which resets the counter.
- o Latch pulse which samples the final data of the counter and outputs it to the PWM generator.

The pulse produced by delaying the rise of the shaped CFG pulse is the latch pulse, and the pulse produced by delaying the latch pulse is the reset pulse.

When the reset pulse is applied to the counter, the counter starts counting the clock pulses. This count is set at the fall of the shaped CFG, sampled by the latch pulse and is fed to the PWM generator.

The 3.5 kHz circulating count data is always supplied to the PWM generator from the reference signal generator.

The circulating data is modulated by the latch data and output as a PWM signal.

The 3.5 kHz PWM wave observed at pin 22 is a square wave with a duty cycle of 50% - 50% in normal rotation, and this

is converted to a DC voltage through Q504 and supplied to the capstan motor to control the motor.

3 tape speeds are provided to the capstan motor, so when the clock pulse with the same frequency is counted, the count data differs depending on the speed. So, frequency of the clock pulse is changed so that the count data in 1 CFG period during normal rotation is constant in every mode. It is 447 kHz in the SP mode, 223 kHz (447 ÷ 2) in the LP mode and 112 kHz (447 ÷ 4) in the EP mode.

*-1 The pulses generated by the pulse generator are actually 3 as shown in the block diagram, and the 3rd pulse is the clock gate pulse which gates the clock pulse. The clock gate pulse is used to ensure the counter reset operation and latch operation, so it is omitted from the description depending on its importance.

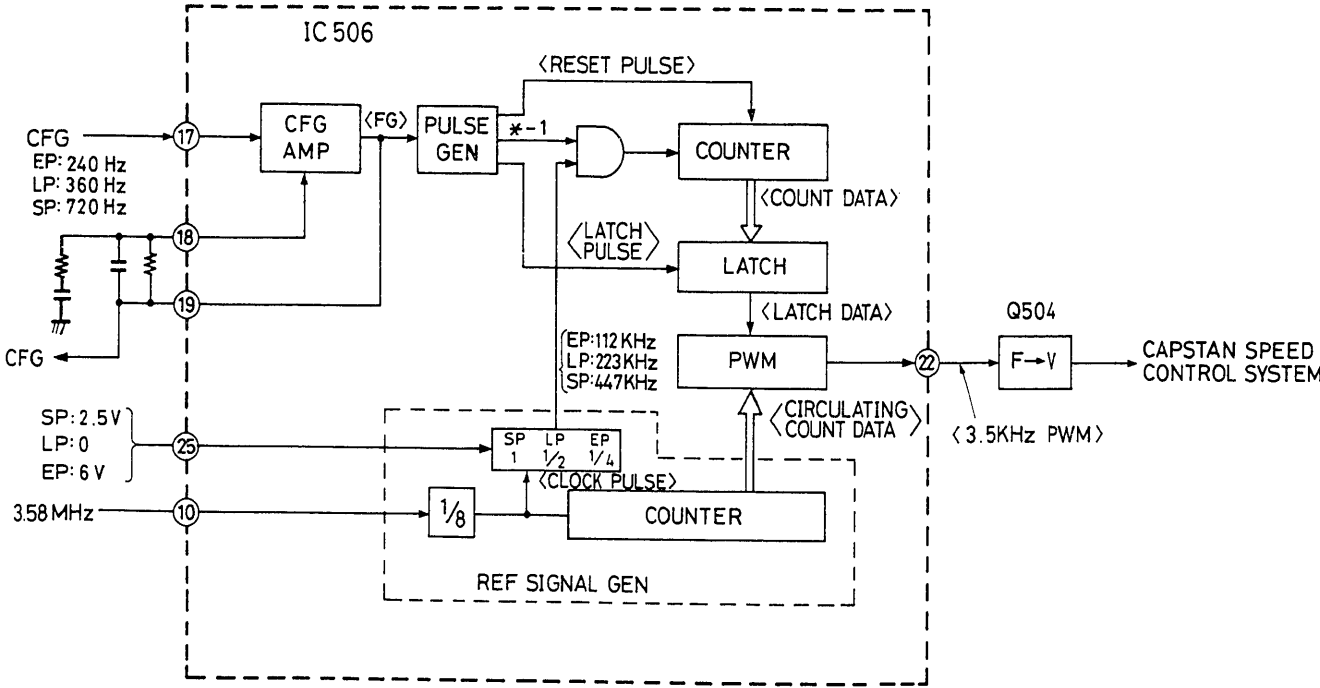


Fig. 7-a Capstan speed control block diagram

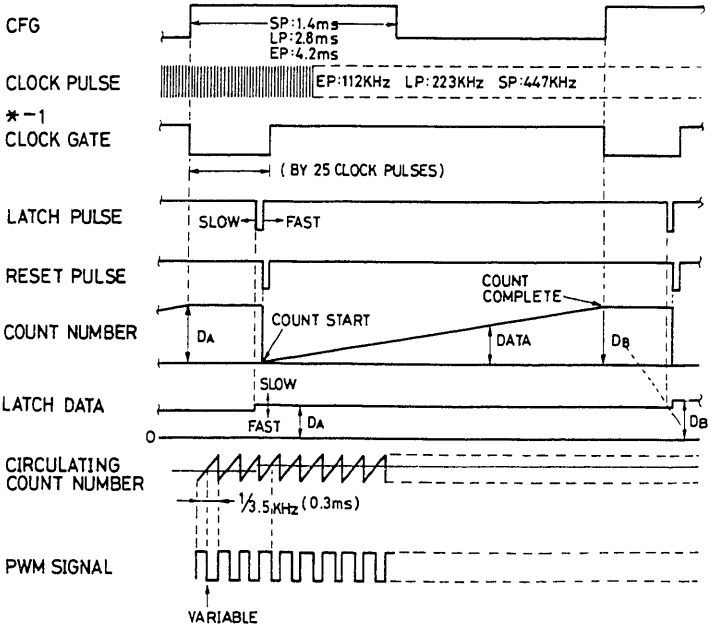


Fig. 7-b Capstan speed control timing chart

Phase control

The phase control system detects the CTL pulse during play, compares its phase with that of REF30 (reference signal) and controls the tracking so that the video head always starts tracing the specified track from the specified position and completes tracing faithfully following the pattern. The system compares the phases of the capstan FG and REF30 during recording, and controls so that the video head can record at a specified interval.

Fig. 8-a shows the capstan phase control system.

Composition of the capstan phase control system is basically the same as other 2 control systems. However, the differences of this control system are as follows:

- The clock counter is used in common with the counter inside the reference signal generator.
- The bit selector which changes over the frequency of the PWM signal according to the tape speed so that the sampling data does not differ when the capstan motor speed is changed.

The signal picked up by the CTL head is amplified, delayed and input to IC506-pin 13 during play. (Refer to the item "recording/playback of control pulse" for the process until the signal is applied to pin 13 and the tracking preset).

The delayed CTL pulse is fed to the pulse generator to generate the latch pulse from this pulse. At the same time, the clock measurement of the counter is controlled by REF30 and done by repeating reset every period of REF30. CFG is applied to pin 17 during recording. This CFG is divided by the divider to be the 30 Hz pulse. The divider is changed over to the circuit configuration with a division ratio corresponding to the tape speed by the data from pin 25. The pulse obtained here is supplied to the pulse generator and generates the latch pulse.

The counter data is transmitted to the latch circuit every 30 Hz period. This data is sampled by the latch pulse. The latch data thus obtained is supplied to the PWM generator to modulate the circulating counter data which is another input of the generator, and generates the PWM wave. This circulating count data is supplied to the PWM signal generator from the bit selector in the reference signal generator; it is selected by the input of pin 25 so that it is set to the frequency 1748 Hz in the SP mode, 874 Hz in the LP mode, and 437 Hz in the EP mode according to the tape speed. As a result, the PWM wave obtained at pin 23 is 1748 Hz in the SP mode, 874 Hz in the LP mode and 437 Hz in the EP mode.

The PWM wave obtained in this way is converted to the DC voltage by Q503 and added to the output of the speed control system, then it is supplied to the capstan motor. The gain of Q503 is changed over between EP and LP by means of IC503.

As for the timing chart of the PWM operation according to the change in motor speed, refer to the PWM operation in Fig. 8-d PWM OPERATION OF CAPSTAN PHASE CONTROL.

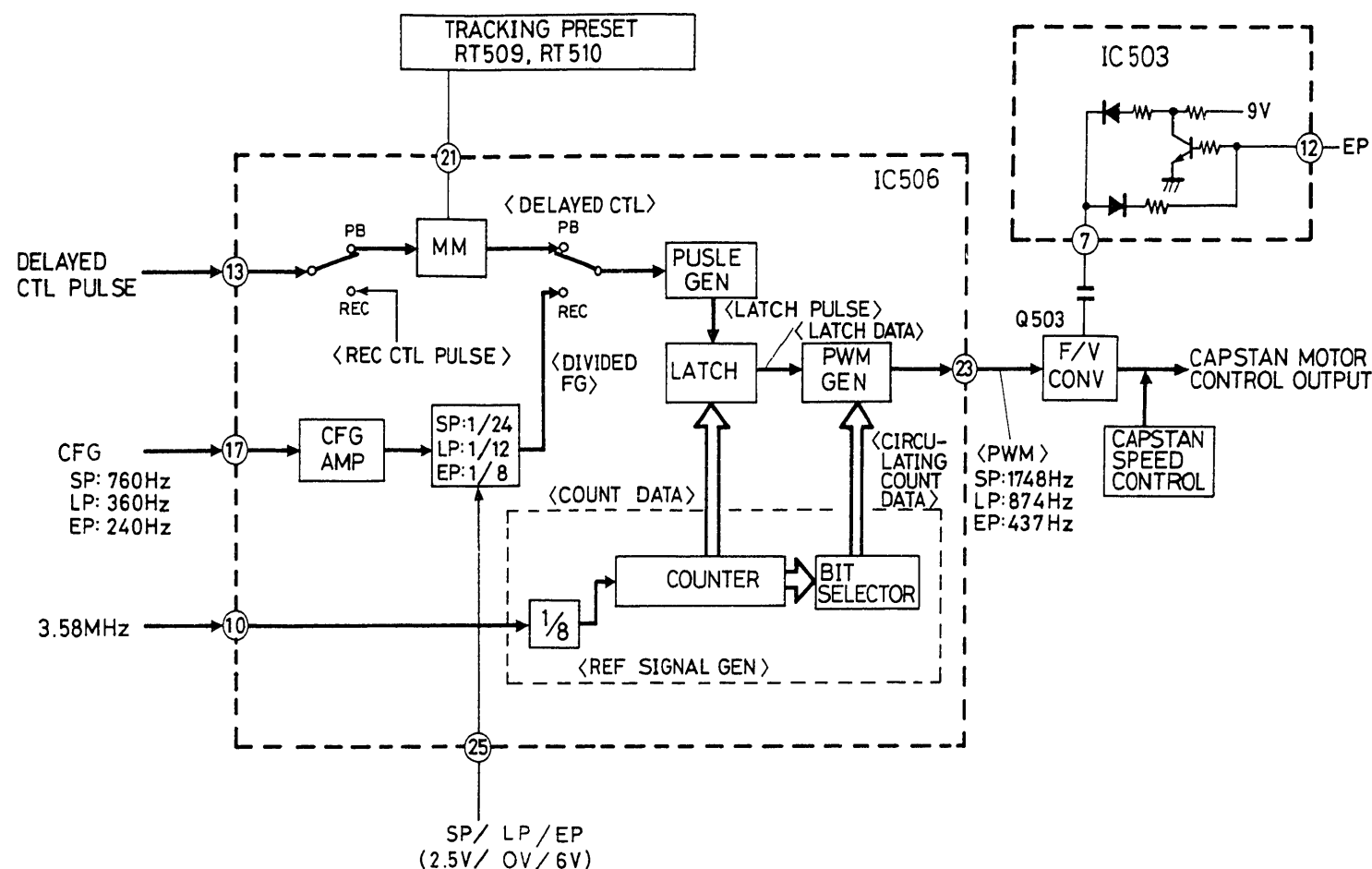


Fig. 8-a Capstan phase control block diagram

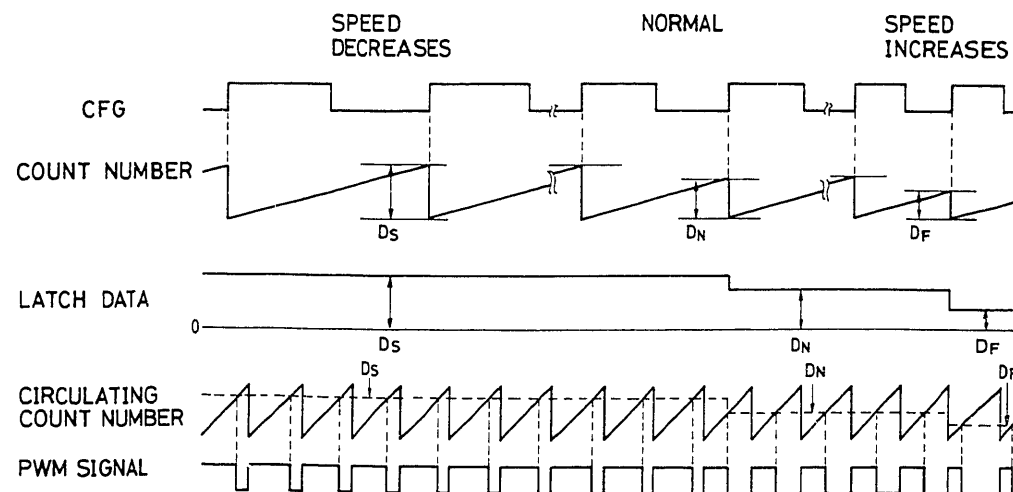


Fig. 8-d PWM operation of Capstan phase control

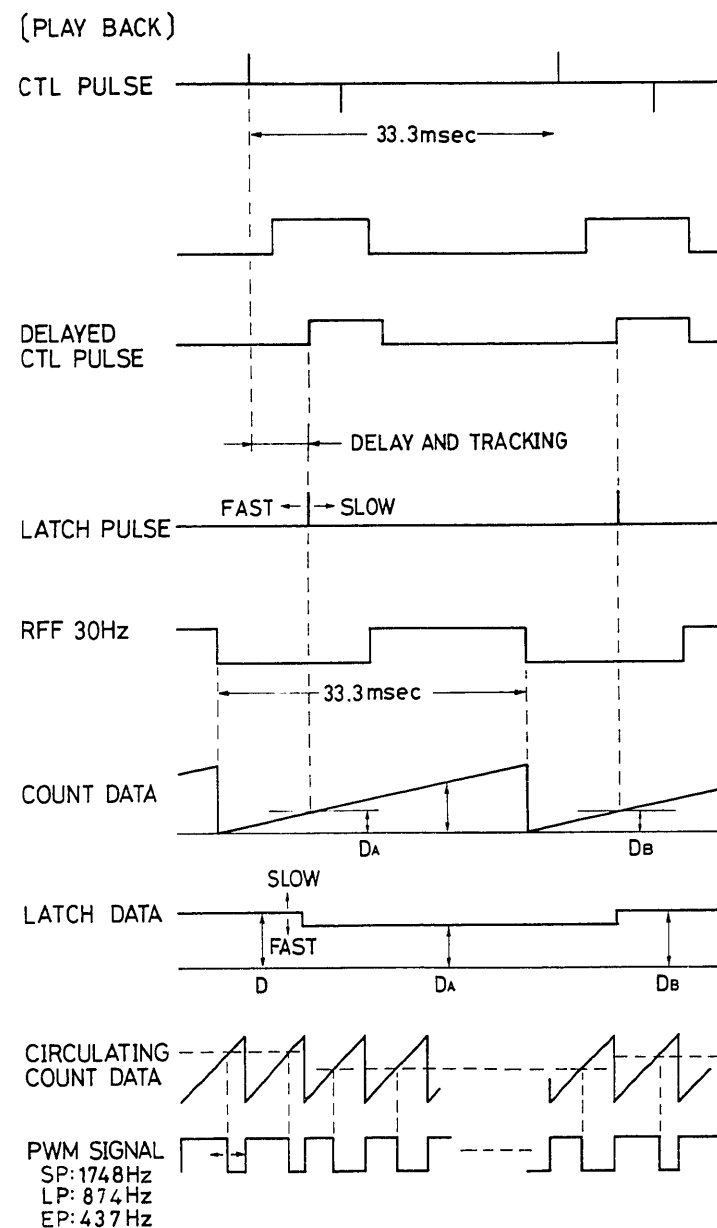


Fig. 8-b Capstan phase control timing chart (Play mode)

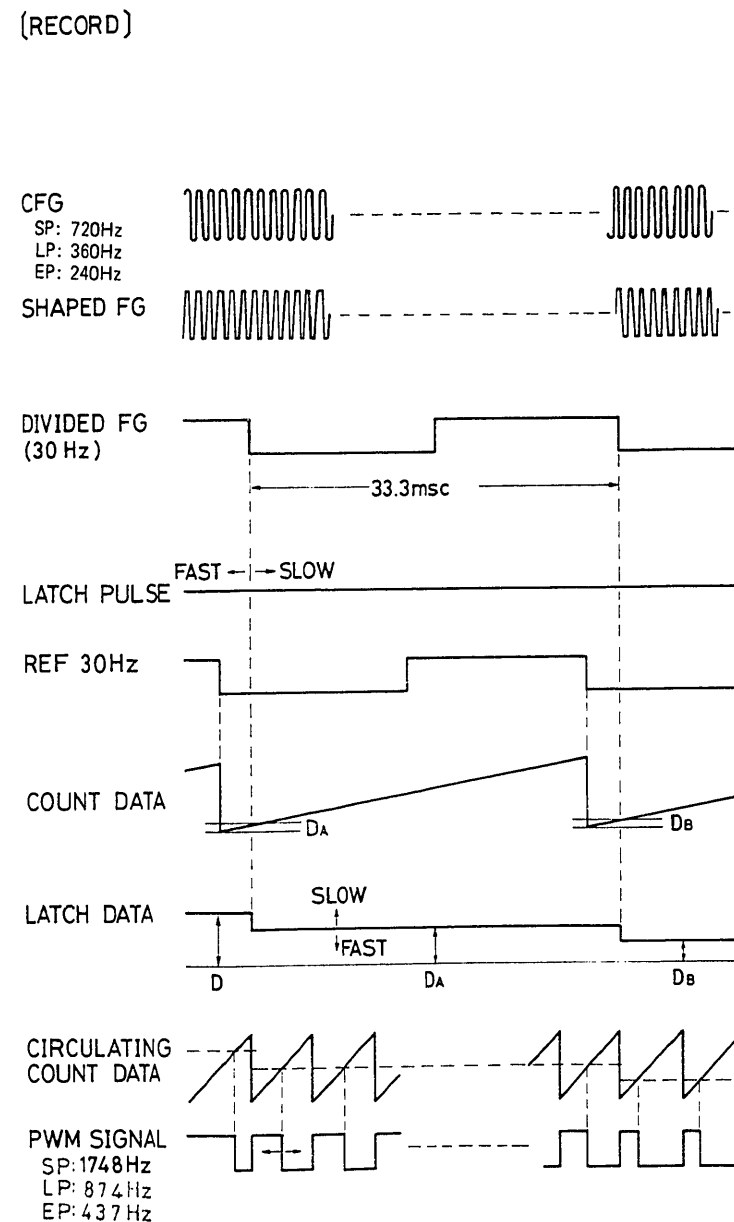


Fig. 8-c Capstan phase control block diagram (Rec mode)

Correction of capstan control output

The PWM wave at pins 23 and 24 of IC506 which is the capstan control output contains a small pulse with one pulse width at 30 Hz periods. This pulse instantaneously sets the capstan speed to be uneven causing wow and flutter. The capstan control output correction circuit IC503 corrects this pulse.

Fig. 9 shows the correction circuit.

IC503 is composed of a 2-stage monostable multivibrator; it detects a narrow width pulse in the capstan speed control PWM signal, and then applies the correction pulse obtained from the monostable multivibrators to the speed control system and phase control system.

The PWM output (IC506-pin 24) of the speed control system is sent to IC503-pin 5. The PWM pulse is differentiated in IC503, and the differentiated pulse triggers the 1st stage monostable multivibrator using its leading edge. The monostable multivibrator generates a positive pulse (0.1 msec width). This pulse is applied to the small pulse-width section of the speed control system through pin 5 via the emitter and base of Q3. As is seen from the diagram, the PWM wave is applied to the base of Q3, so even if the monostable multivibrator always generates the pulse, it is not added to the PWM wave when the pulse width does not become 0.1 msec or less. At the same time, when Q3 is activated, the correction pulse is supplied to the monostable multivibrator in the next stage. The pulse triggered and generated by this pulse is added to the PWM wave in the phase control system via D529 from pin 2.

There is danger of damaged pulses with narrow width in the EP mode in the phase control system, so the power for the monostable multivibrator is supplied from the EP signal applied to pin 12, and other power is supplied from the DC control output obtained by rectifying the PWM signal to automatically vary the width of the correction pulse and to set it to be proportional to the existing control condition to some extent. This is applied to pin 4 via D528.

The width which is the reference of the correction pulse in the phase control system can be set by RT501 of pin 1.

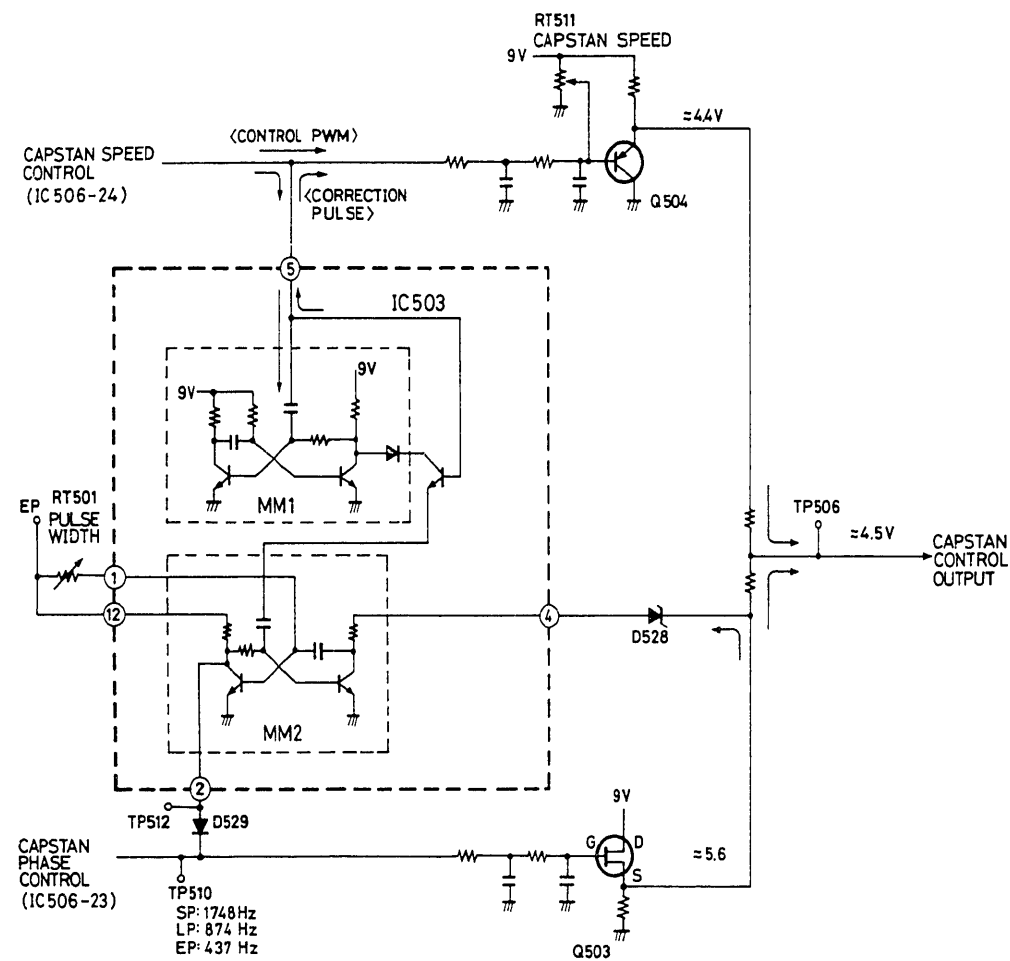


Fig. 9-a Capstan control output correction circuit

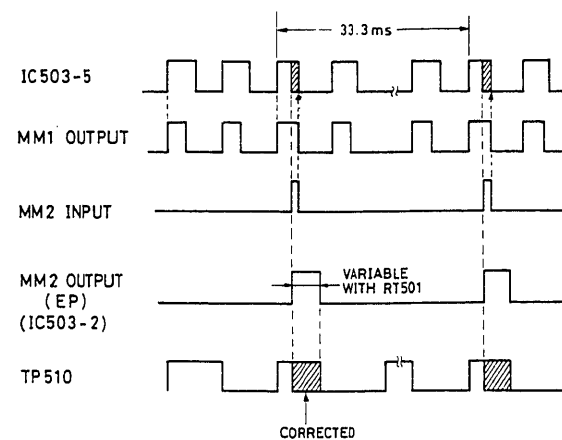


Fig. 9-b Capstan control output correction circuit timing chart

AUTO-SELECTION OF TAPE SPEED

This circuit detects the recording tape speed during play and automatically changes it over to the speed in the recording mode, and detects the tape speed switch position during recording to automatically change over to the correct speed.

The tape speed is determined by the number of CFG per CTL pulse. That is,

EP mode: $720 \text{ Hz}/30 \text{ Hz} = 24$

LP mode: $360 \text{ Hz}/30 \text{ Hz} = 12$

SP mode: $240 \text{ Hz}/30 \text{ Hz} = 8$

By detecting these values, the speed during recording can be judged. (*-1)

Fig. 10 shows the tape speed select circuit.

IC508-pin 7 receives 9V in EP, 0V in LP and 4.5V in SP sent from the speed select switch during recording, and outputs as shown in the table to pins 13 - 16 using the comparison data between the CTL pulse of pin 5 and CFG of pin 1 during play.

That is, pin 13 is set to 2.5V and pin 16 to Hi in the SP mode, pin 13 is set to 0V and pin 15 to Hi in the LP mode, and pin 13 is set to 6V and pin 14 to Hi in the EP mode.

When the VTR enters the slow, frame advance, pause, load and stop modes from the play mode, the tape speed during play can be stored in each mode. (Note: SP is kept in the stop mode after power is supplied)

IC508 (Tape speed detection circuit) is composed of the mode switch which selects REC/PLAY, the counter which measures the ratio between CFG and CTL pulses, the mode

detector which detects the tape speed using the measured data and the output converter which converts the output from the mode detector to the output by mode and outputs it.

The data (pin 7 input) of the speed select switch and the mode data (pin 9 input) in other modes than standard play are changed over in IC508. This selection is done by PB9V, INSERT and CYL STOP (*-2) applied to pin 8 and the pin 7 input is selected during recording (pin 8: Lo).

The ratio between CFG of pin 1 and the CTL pulse of pin 5 is measured during play, and the tape speed is detected by the mode detector using this data.

At the same time, the data from the mode switch is input to the mode detector, and the previous speed discriminating data can be held by the pin 9 input when the modes other than recording are entered from the play mode.

F. ADV, SLOW, CYL STOP (Hi signal during cylinder stop), LOAD and PAUSE signals are applied to pin 9 from the system control circuit via diode OR.

*-1 Tape speed 12, 6, 4 produced by dividing 24, 12, 8 by 2 are the objects of detection. The judgement ranges of the detector are:

SP: 0 - 4, LP: 5 - 7, EP: 8 - 12.

*-2 Cylinder stop. The cylinder motor rotating signal is generated in the system control: This is the inverted CYL ON signal, and is set to Hi during cylinder stop, that is, in the fast forward, rewind and stop modes.

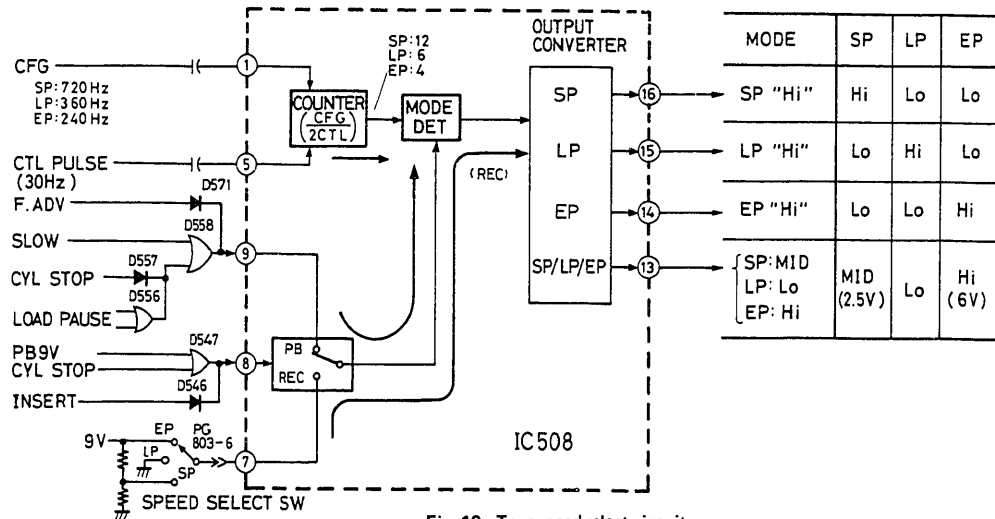


Fig. 10 Tape speed select circuit

This can be entered from the play mode by operating the remote control unit. The relations between each mode and search speed are:

Mode	Play speed	Search speed
SP (Standard)	3.3 cm/sec	4 times
LP (Double)	1.7 cm/sec	8 times
EP (Triple)	1.1 cm/sec	12 times

[illegible]

41

Mode	REF 30 Hz
Play	29.73 Hz
Forward search	30.63 Hz
Reverse search	29.1 Hz

42

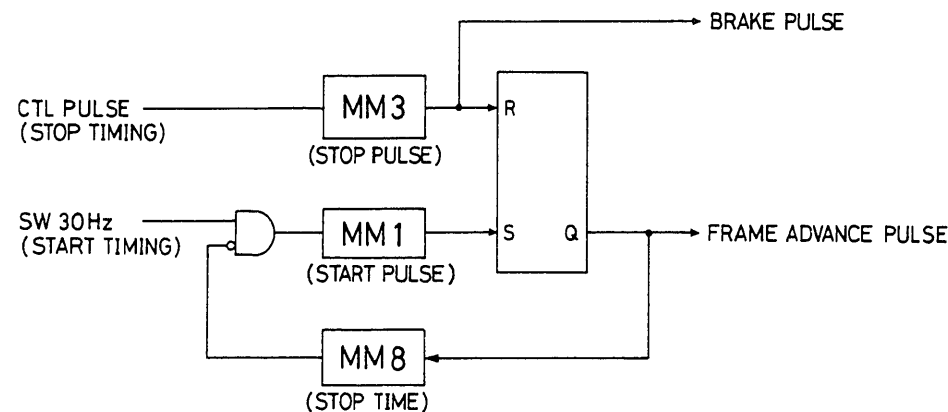


Fig. 12-a Slow operation principle diagram

TIMING CHART OF SLOW OPERATION

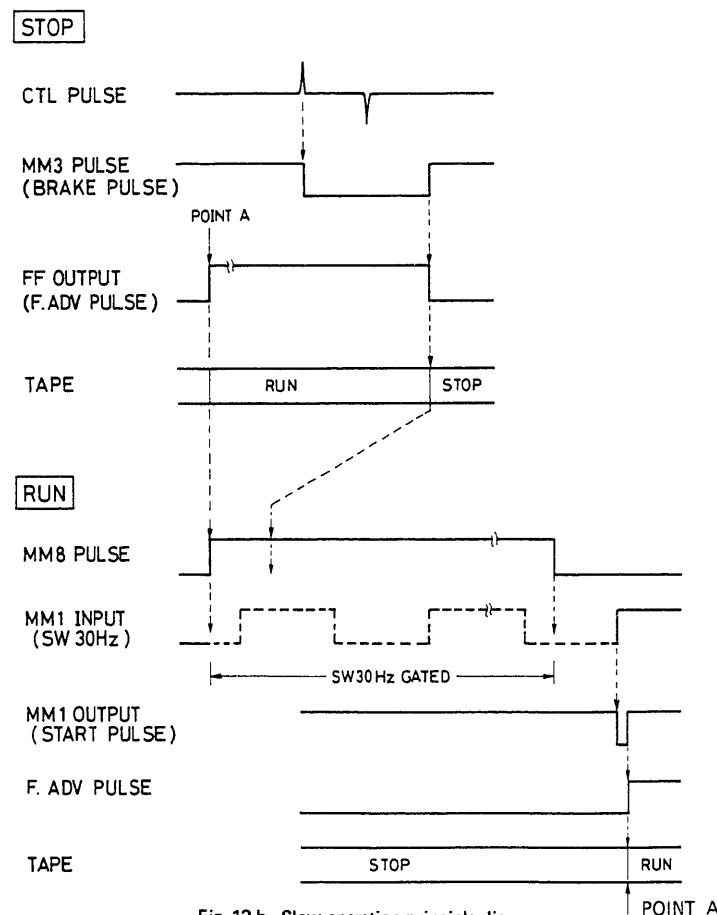


Fig. 12-b Slow operation principle diagram

Tape running stop

The played back CTL pulse is applied to MM3 to obtain the brake pulse when freezing the picture.

The pulse obtained by MM3 is applied to the capstan reversing system as the brake pulse (negative pulse) to stop the capstan. At the same time, the frame-advance pulse generation circuit is reset at the rise of this pulse to set the output to Lo to stop the capstan motor.

Tape running start

The stop time control monostable multivibrator generates a pulse with the width previously set, by the frame-advance pulse when starting the tape from the stop mode.

SW 30 Hz is gated by this pulse (during the stop mode).

When this pulse changes from Hi to Lo and passes SW 30 Hz, SW 30 Hz triggers MM1 and transmits the start pulse to the frame-advance pulse generation circuit. The frame-advance pulse is generated (by inversion of FF), and the capstan motor starts.

When the capstan motor starts, it continues turning until the next brake pulse is generated (playback of CTL pulse). The capstan motor is driven intermittently in this way to perform the SLOW operation. As a result, the brake pulse can be controlled by varying the time constant of MM3, and the SLOW speed can be controlled by varying the time constant of MM8.

Actual operation is described in the following referring to Fig. 13.

SLOW OPERATION

When the SLOW button of the remote control unit is operated, the system control μ P generates "SLOW" (Hi). This signal is sent to IC501-pin 7 and IC509-pin 1 in the servo circuit.

When IC509 receives this "SLOW" (Hi) by pin 1, it sets pin 17 to Lo, to set the stop time control monostable multivibrator MM8 to the operable condition, and then changes over the switch of the drive pulse circuit to the "SLOW" side. This causes the following operation.

When pin 17 is set to Lo, the time constant circuit is formed for the tracking monostable multivibrator MM2 by the slow tracking output of IC501. As a result, tracking adjustment during the SLOW mode becomes possible using the tracking button of the remote control unit.

(Description concerning IC501 is done later)

Q510 in the brake pulse control circuit is cut off, so the time constant of the brake pulse monostable multivibrator can be regulated by RT513 in the EP mode, and by RT512 + RT513 in the SP mode.

When the stop time control monostable multivibrator MM8 starts operation, it is triggered by the output of the drive pulse generation FF and set to the condition possible to generate the pulse which regulates the stop time. That is, SW 30 Hz is gated by this pulse entering the condition possible to control the start pulse generation.

When the internal switch is changed over to the "SLOW" side, the frame-advance pulse is shaped to the step wave by MM5, and the rise of the capstan motor drive can be made earlier.

When "SLOW" (Hi) is applied to IC501-pin 7, the internal speed amplifier is set to the operation mode and pin 12 is set to Lo.

When the speed amplifier enters the operation mode, the value of remote slow speed control coupled to pin 9 is output from pin 8 by the amplifier to control the time constant (stop time) of MM8.

When pin 12 is set to Lo, the EP tracking preset circuit is disconnected from the time constant circuit of MM3 and only the brake pulse control circuit is connected.

The CTL pulse is input to IC509-pin 19 just after the SLOW operation. Slow tracking control is done in MM2 using this CTL pulse, and the brake pulse is generated in MM3. Part of this brake pulse is applied to the capstan motor through pin 14 to reduce the capstan motor speed. Another part of the brake pulse is applied to the drive pulse control FF to reset it. As a result, the FF output is set to Lo and the capstan motor stops.

MM8 is triggered by the FF set timing and it generates the SW 30 Hz gate pulse. When this gate pulse is set to Lo from Hi, SW 30 Hz is applied to the start pulse generation monostable multivibrator MM1, and MM1 is triggered by SW 30 Hz to generate the start pulse.

The start pulse sets the FF and sets the Q output to Hi.

This Hi is held until reset, that is, until the brake pulse is generated. The capstan drive pulse is formed by the pulse produced by delaying this Q output and $\bar{Q}$ output by MM5. At the same time, MM8 is simultaneously triggered by the Q output, so the SLOW operation is repeated. When the SLOW operation is released, pin 1 is set to Lo, and the brake pulse and drive pulse are not generated.

Slow mode when camera is connected

When a camera is connected, the SLOW tracking is set to the center and the SLOW speed, to max.

When a camera is connected, Hi is applied to IC501-pin 11 by the camera connector switch, the SLOW tracking and SLOW speed systems in IC501 are grounded. As a result, the SLOW tracking is changed over to be set to the center by the resistor between pin 11 and pin 13. The slow speed system is set to the condition that pin 9 is grounded, that is the max. speed mode.

STILL OPERATION

In STILL operation the picture is freezed with noise eliminated in the play mode. This operation is performed when the VTR enters the slow play mode within a specified period obtained by making the pause signal as a trigger. When the pause button is pressed, the PAUSE signal is applied to IC501-pin 2. "STILL" (Hi) during play, "PAUSE" ($1/2 V_{CC}$) during recording are obtained at pin 6 by means of this "PAUSE" signal and the "REC/DUB" signal at pin 3.

This signal is applied to IC509-pin 2. "STILL" (Hi) is OR-connected with "SLOW" (Hi), so IC509 performs the same circuit operation as SLOW mode during the STILL operation. This SLOW period is determined by the period of the pulse generated by MM6 which is triggered by "STILL" (Hi).

The switch connected to pin 4 is set to OFF during the period of the pulse generated by MM6 during the STILL mode. As a result, MM8 performs the SLOW operation regulated by the time constant coupled to IC509-pin 4. IC501-pin 8 is connected to pin 4, and this output is determined by Rs during the STILL mode.

This is because the slow speed control line is shut off by the "STILL" (Hi) generated inside IC501, and Rs is connected to pin 8 instead.

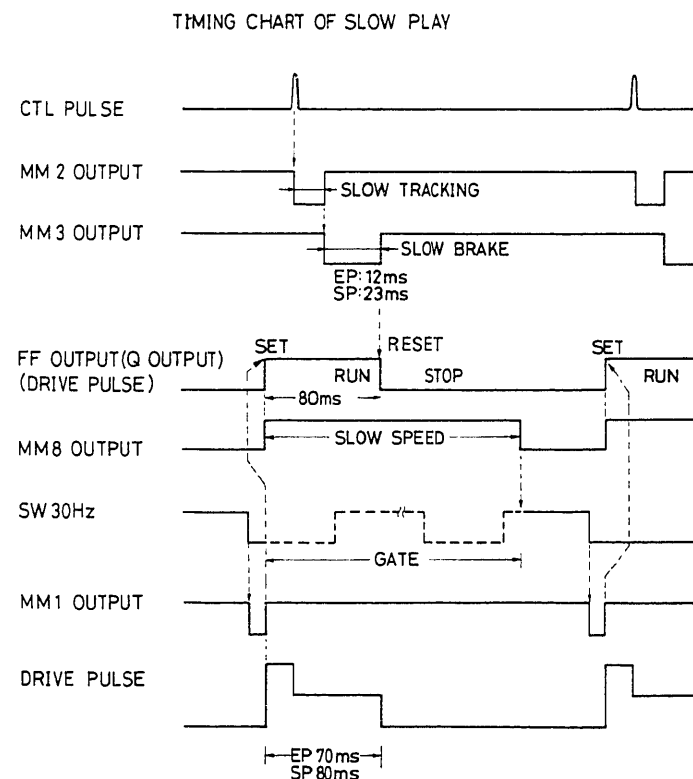


Fig. 13-c Slow, still and frame advance circuit timing chart

FRAME ADVANCE OPERATION

The frame-advance operation is simply a variation of still operation; 1 frame is advanced in the STILL mode by the frame-advance button operation, and the VTR enters the STILL mode again.

This is the condition that only one slow operation is performed, when explaining using circuit operation.

When the frame-advance button is pressed in the STILL mode, the frame-advance pulse (700 - 800 msec) is generated, and this pulse is sent to the servo circuit through PG801-pin 5.

This pulse is input to IC501-pin 5, grounds the SLOW time

constant circuit during the STILL mode, and changes over this time constant circuit to R581. This pulse is also applied to IC509-pin 1 via D567, so the IC509 circuit configuration is set for the SLOW operation.

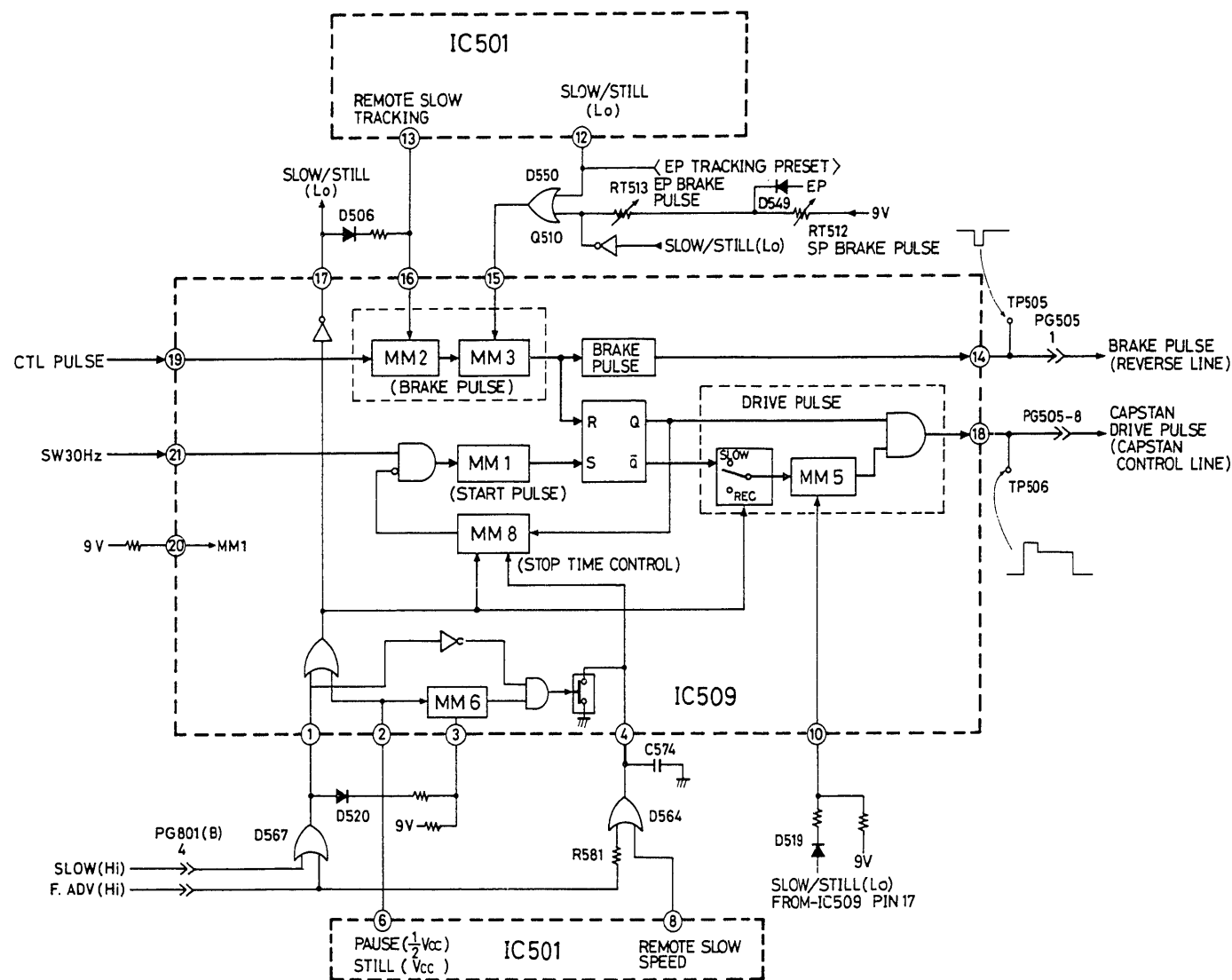


Fig. 13-a Slow, still and frame advance circuit (I)

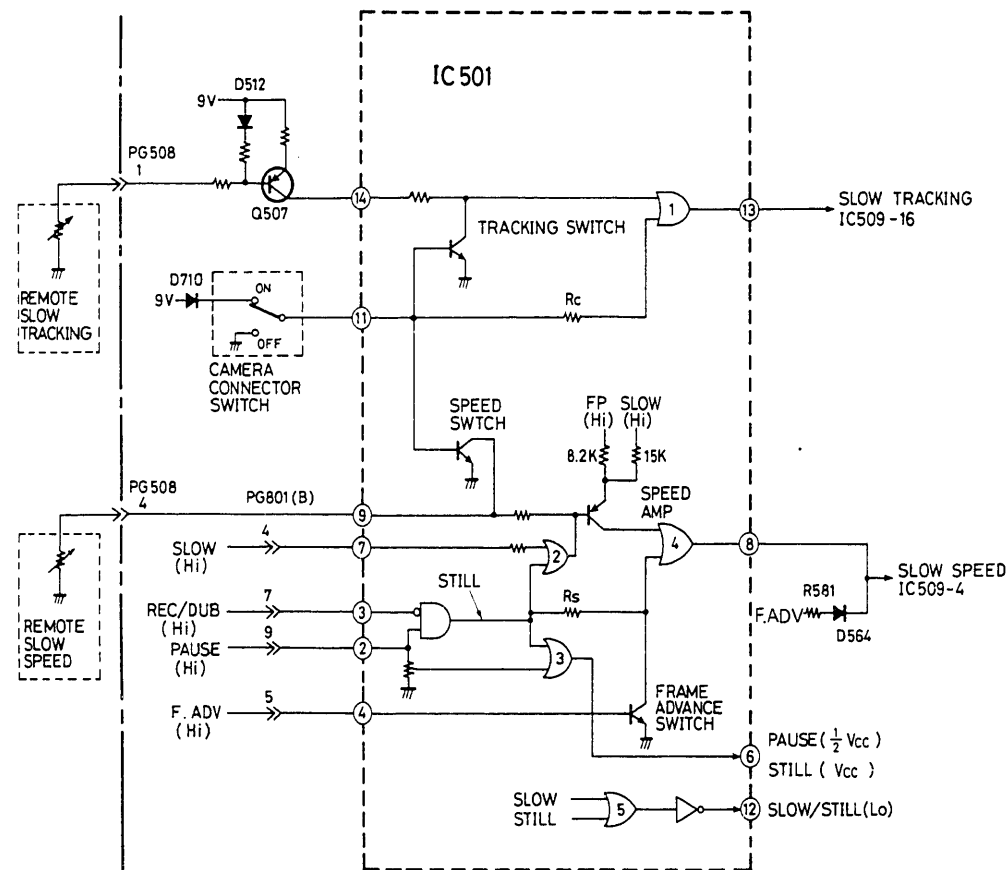


Fig. 13-b Slow, still and frame advance circuit (II)

SLOW PICTURE SKEWING CORRECTION

The capstan motor is intermittently operated during SLOW play, so at the start of repeated stop - operation period, the tension of the tape increases resulting in an increase of the cylinder load, and so skewing of the picture occurs.

This skewing occurs especially during the SLOW play in the SP mode in which the motor start time is short (quick rising).

Fig. 14 shows the skewing correction circuit.

IC505 is the circuit to correct this skewing. That is, this circuit supplies power to the motor which can cancel this load during the period when the load to the cylinder is increased. This correction circuit is composed of the 2-stage monostable multivibrator built into the IC; the pulse 10 msec delayed from the rise of the capstan drive pulse is produced by the 1st stage circuit, and then this pulse is made to the load canceller pulse (width: 30 msec) in the 2nd stage circuit.

As was described previously, the load differs in the SP and EP modes, so the circuit to adjust it is installed in the output stage to adjust the amplitude.

The motor drive output pulse during the SLOW play is derived from IC509-pin 18, and this is applied to IC505-pin 9. The pulse from pin 9 is differentiated inside the IC and it triggers the 1st stage delay monostable multivibrator. This monostable multivibrator generates the pulse with 10 msec delay. This delayed pulse is shaped to a pulse with a width of 30 msec by the shaping monostable multivibrator in the next stage. The shaped pulse thus obtained is supplied to the cylinder motor through pin 1.

Q502 is activated and the amplitude of the shaped pulse can be varied by RT503 in the SP mode, and in the EP mode, it is possible with RT502 because Q501 is activated. Skewing of picture can be controlled to a minimum by these adjustments.

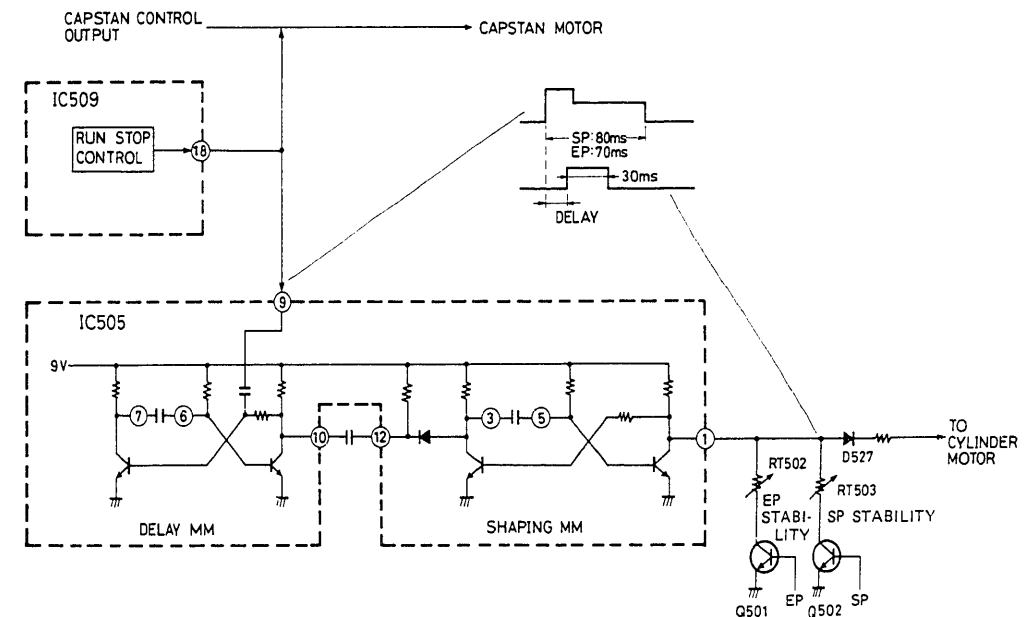


Fig. 14 Slow picture skewing correction circuit

PHASE MATCHING

OUTLINE

This is the following operation.

Starting recording again while matching the phase of the control pulse at the re-start of recording and the played back phase of the control pulse from the previously recorded section, so that the joint in the picture is not conspicuous when starting recording again after pause in the record mode.

Fig. 15 shows the principle diagram of the phase matching circuit.

To execute phase-matching of the CTL pulses, the phases of the vertical sync signal to be recorded and the play CTL pulse are compared and matched. This causes the phases of the CTL pulses to be matched equivalently.

When the pause operation is done during recording, the capstan is turned in the reverse direction. The CTL pulses detected meanwhile are measured by the up-counter. When the pause is released in this condition, the switch is changed over to the "P. M" side, the phase of the 1st CTL pulse detected from the tape which is starting to run by pause-release and the phase of the vertical sync signal in the video signal to be recorded are compared by RS-FF. FF generates the brake pulse corresponding to the phase difference to match the phases of the CTL pulse and the vertical sync signal. At the same time, the up-counter is changed over to a down-counter. The CTL pulses detected during tape running are applied to this counter and are subtracted from the previous data. The phase control system is operated by the vertical sync signal to prevent phase drift during this down-count period. As a result, when the CTL pulse at the rewind start (data "0" position) is detected, the control output

from the counter is set to Lo to release the monitor-cut and the phase matching is completed and recording starts.

Fig. 16 shows the tape running condition during phase matching operation.

A) + B) When the pause operation is done in the recording mode, the tape is rewind approx. 0.7 sec while being kept loaded. In the meantime, the CTL pulses are measured. When the rewind operation is completed, the loading motor turns in reverse to move the guide roller to the pause position and stops.

B) + C) When the pause operation is released in the recording mode, the loading motor turns to return the guide roller to the recording position and compresses the pressure roller against the capstan. The tape is advanced to the position where the pause operation starts after matching phases of the vertical sync signal in the video signal to be recorded and the CTL pulse on the tape. The detected CTL pulses are subtracted from the counted number of CTL pulses.

As a result, when the tape returns to the pause start position, the counter is set to "0".

This completes the operation of the phase matching circuit.

C) + D) When the operation completes, recording starts from the position corresponding to the next CTL pulse on the track.

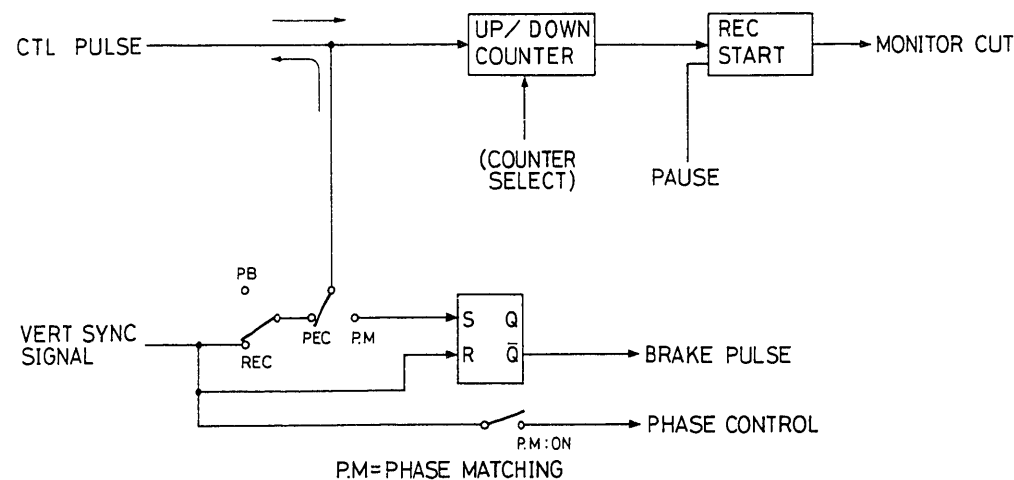


Fig. 15 Phase matching operation principle diagram

A) PAUSE START

B) REVERSE
• CTL PULSE
MEASURED

C) DETECTION OF
REC START
POSITION
• CTL PULSE
MEASURED

D) RECORD AFTER
PHASE MATCHING

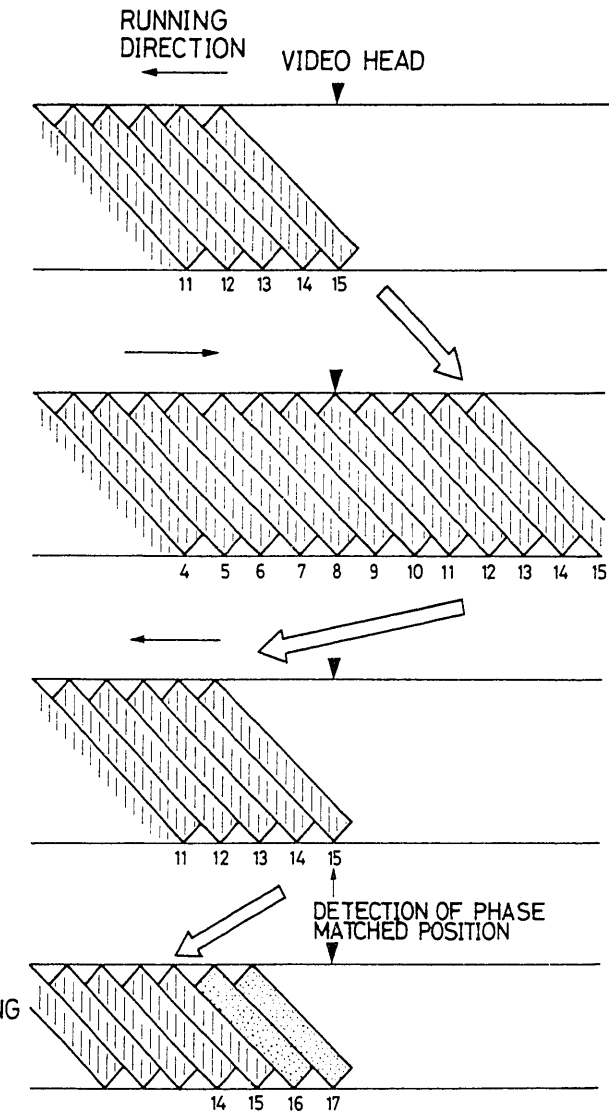


Fig. 16 Tape running during phase match edit

Fig. 17 shows the phase matching circuit.

The reverse signal is applied to IC504-pin 11 and IC509-pin 8 to play and measure the CTL pulse during reversing. IC504-pin 11 is set to Lo by the reverse signal and the CTL pulse record route is grounded. This causes recording of the CTL pulse to be inhibited. IC509 sets the U/D counter to the μ P-counter composition by means of the reverse signal. At the same time, the reverse signal is applied to the capstan motor reversing system via D522 and turns the capstan motor in reverse. The CTL pulse played back meanwhile is applied to the counter from IC509-pin 19 and is measured.

IC506 inputs the pause signal (and loading signal) and grounds the CTL pulse during the pause mode.

When the pause mode is released, IC509 performs the phase matching operation.

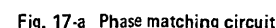
The tape running starts when the tape reaches the recording position after loading. The reverse signal of pin 8 is not applied to the U/D counter, so it is set to the down-counter

The MM3 is used as the CTL pulse delay monostable multivibrator at the EP tape speed, however, the EP delay of MM3 is inhibited to compare the phases of the play CTL pulse and the vertical sync signal in the phase matching operation.

That is, RS-FF is set by the CTL pulse applied to IC506-pin 13 when the VTR enters the phase match edit mode.

Now, when the phases are roughly matched during the 1 CTL period, the CTL pulse coming in sequence is subtracted by the counter, and this operation continues until the counter data is set to "0". The phase control is applied by the vertical sync signal inside IC506 during this down count period.

When the counter data becomes "0", IC509-pin 7 is set to Lo, IC506 is set to the record mode and the video system starts recording.



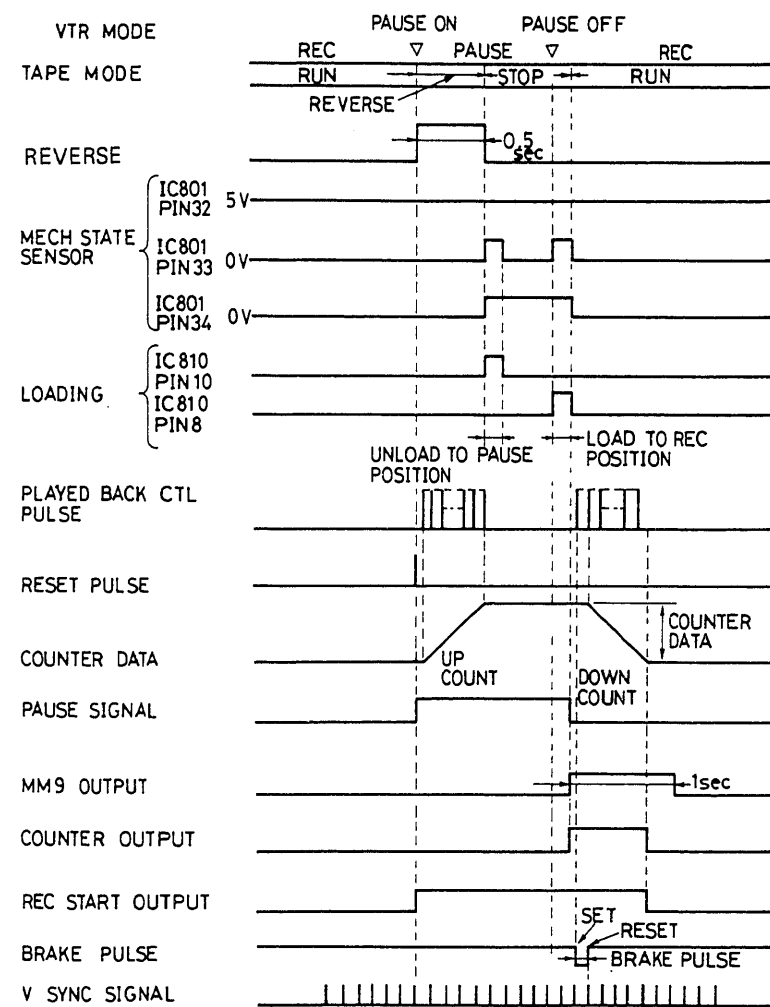


Fig. 17-b Phase matching timing chart

POWER SUPPLY SECTION

CONFIGURATION OF POWER SUPPLY SECTION

Fig. 1 is a block diagram of the power supply section. The power voltage obtained from the rectifier circuit board is supplied to the VTR via the timer circuit, channel select circuit, tuner/IF circuit, and 10P DIN cord. The 18V power supply controlled by the regulator circuit is used as the power supply of the VTR.

40V power supply: This is supplied to the regulator circuit board.

Power supply of base bias of power transistor Q901, and the power supply of the timer record signal circuit.

This is obtained by rectifying the AC power supply using D955 and C955.

32V power supply: This is supplied to the channel selector of the U/V tuner.

The AC power supplied from the transformer is rectified to 40V by D955 and this is dropped to the regulated voltage of 32V by Q951 and ZD951.

-30V power supply: This is supplied to the timer circuit board as the display control power supply. Obtained by negatively rectifying the AC power supply using D956 and C956.

-2V power supply: Supplied to the regulator circuit board. Negative power supply to the current limit circuit. Obtained by stabilizing -30V using ZD952.

18V power supply: Supplied to the regulator and timer circuit boards.

Main power supply of this unit. Becomes the VTR drive power supply, timer circuit power supply, remote control power supply by being regulated to 12V.

This is obtained by double-rectifying the AC power supply using D951, D953 and C952.

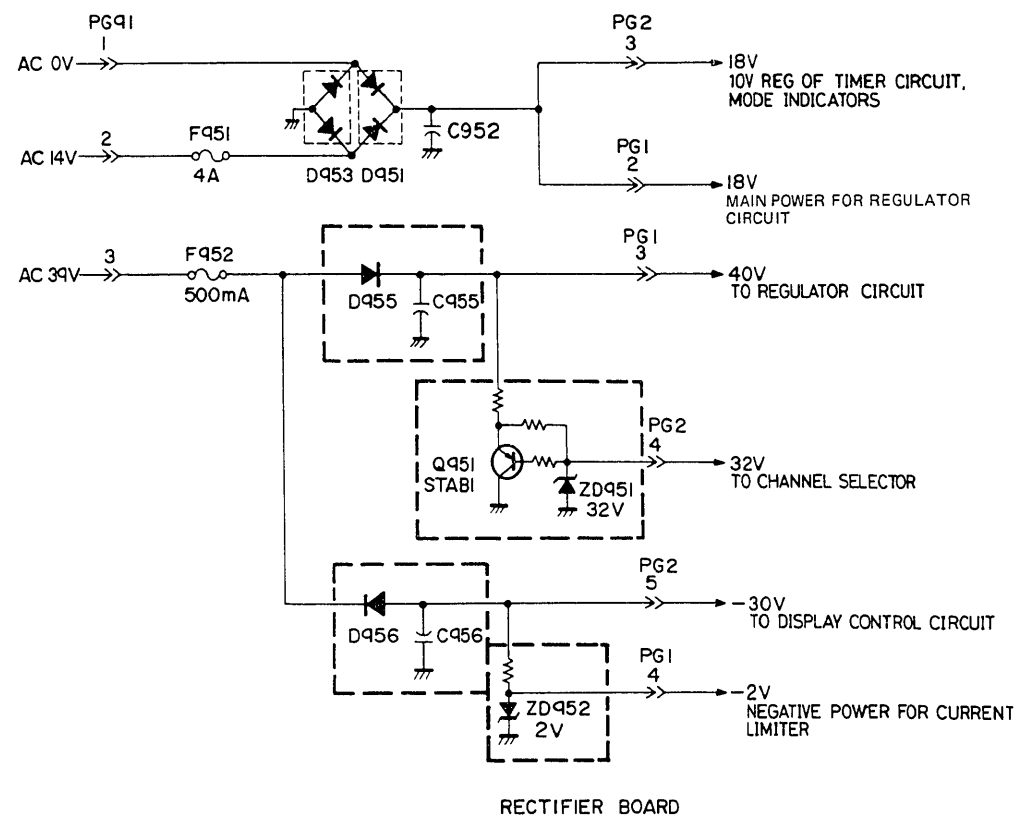


Fig. 1 Power supply block diagram

Power supplies derived from 18V

12V power supply: VTR drive power supply.

This is obtained by changing 18V to 15.4V during charging and 12.5V during the VTR drive by the voltage select circuit on the regulator board.

T12V power supply: This is supplied to the tuner/IF and TV/VTR select switch.

This is obtained from the 12.5V line using the tuner 12V switch.

Fig. 3 shows the tuner 12V generation circuit. T12V is generated when the VTR is in its operation mode.

Q915 generates T12V when Q916 is activated. When the power switch on

10V power supply: This is supplied to the remote control circuit, timer circuit, key circuit, channel select circuit.

This is obtained by dropping the 18V obtained by the rectifier circuit board using the 10V regulator on the timer circuit board.

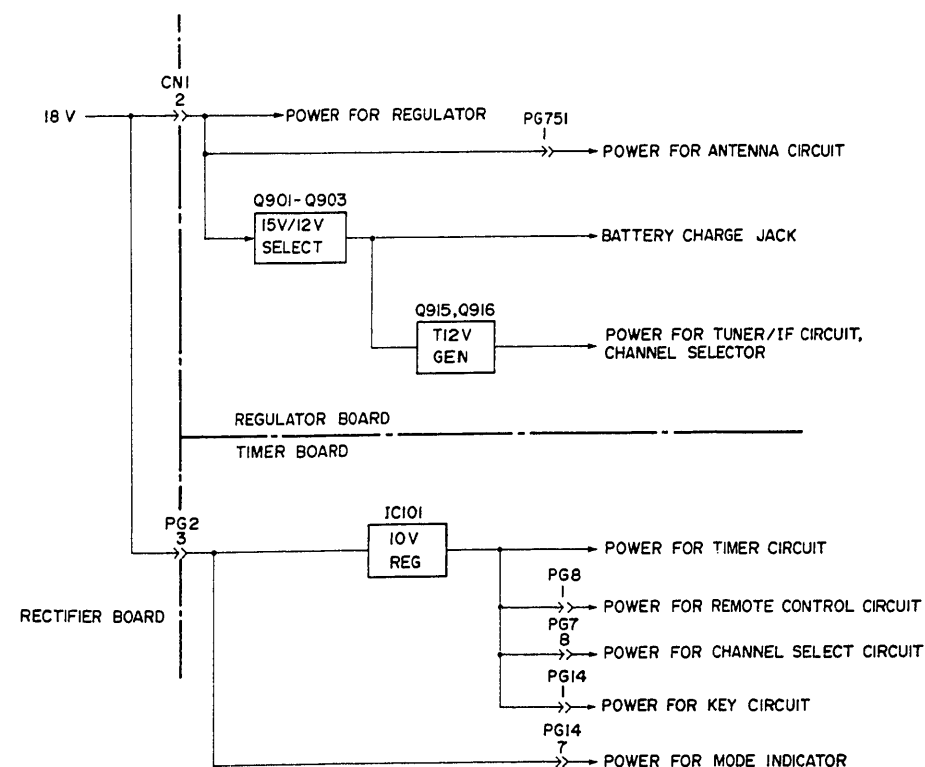


Fig. 2 Power supplies derived from 18V

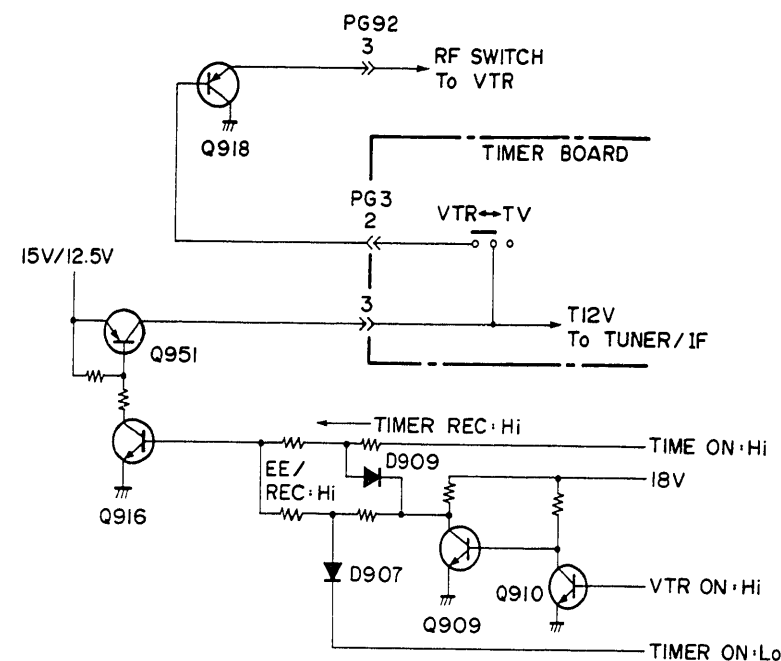


Fig. 3 Tuner 12V (T12V) generation circuit

OUTPUT SELECTION

The output voltage and allowable current are changed over to correspond to the load in the charge, VTR drive, and timer stand-by modes, etc. The 15V/12V voltage select circuit changes over the output voltage and the 0.7A/4A current select circuit changes over the allowable current. The outputs obtained by these 2 circuits are set as shown below according to the conditions of the VTR and the tuner/adaptor.

Condition	Output voltage (V)	Allowable current (A)
Charging completed	14.5	0
During charging	15.4	0.7
VTR ON (During timer recording)	12.5	4

The output voltage and allowable current of this unit are each changed over in 3 steps.

15V/12V VOLTAGE SELECT CIRCUIT

As is shown in the table, the voltage select circuit changes over the output voltage to a max. 15.4V (14.5V when charging is completed) in the charging mode, and 12.5V in the VTR drive mode.

Operation principles

Fig. 4 shows the voltage select circuit.

Basically, the Q901 base current is controlled by Q903 to select the output voltage. The emitter voltage of Q903 is fixed, so the base voltage is fixed in the active mode as a matter of course.

When the voltage obtained at TP901 is fed back to Q903 by means of the resistance circuit, it is changed over to the output voltage corresponding to the amount of feedback of the resistance circuit. Q902 is the circuit to change over this amount of feedback. This circuit performs switching according to the conditions of the VTR and the tuner/timer.

The relation between the Q903 base voltage V_b and output voltage V is shown by the formula below.

$$V_b (= 5.6 + V_{BE}) = V \times \frac{R_y}{R_x + R_y}$$

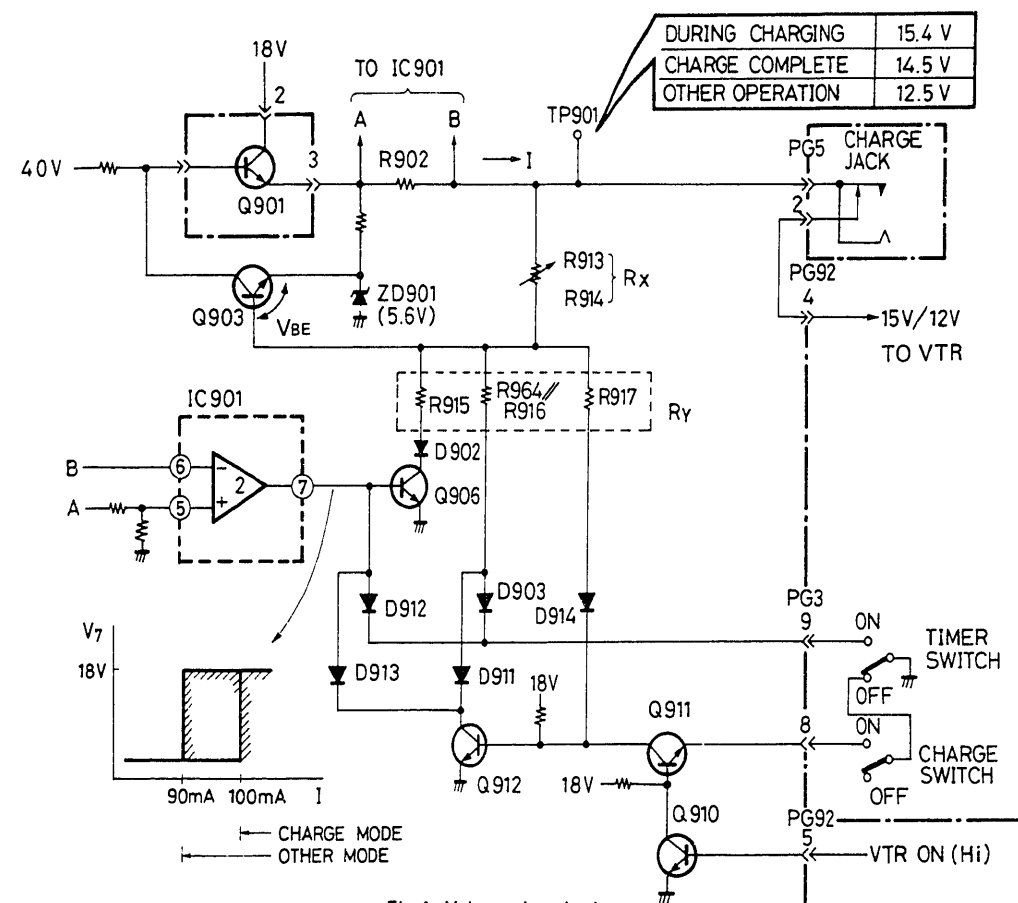


Fig. 4 Voltage select circuit

R_x (series connection of R913 and R914) can be set to approx. 2.2 k Ω - 2.7 k Ω as required by adjusting R914. R_y is the resistance which determines the amount of feedback, the output voltage can be made greater by making this resistance smaller, and the output can be made smaller by making it greater. The selection of this resistance is done by the parallel combination of R915, R964/R916, R917. That is, Q906 and Q911 are activated during the charge mode, obtaining

$$R_y = R915 // R917 = \frac{12 \times 1.5}{12 + 1.5} = 1.3 \text{ k}\Omega$$

to set the output voltage to 15.4V.

When the charging is complete, that the current flowing to the battery is minimized is detected, and Q906 is cut off obtaining

$$R_y = R917 = 1.5 \text{ k}\Omega$$

to set the output voltage to 14.5V.

Q912 is activated during the timer record mode (timer switch ON) or during the VTR operation (VTR power switch ON) obtaining

$$R_y = R964 // R916 = 2 \text{ k}\Omega$$

to set the output voltage to 12.5V (called 12V signal).

The output voltage obtained in this way is applied to the battery charge jack via the VTR jack.

Voltage select conditions

The voltage selection differs depending on the operation of various switches (VTR power switch, VT-TU68 timer switch, charge switch), and also on jacks (VTR internal battery jack or VT-TU68 charge jack) to which the battery to be charged is connected.

As is shown in the previous table, the output voltage is changed over in 3 steps, and those 3 modes are "Charging", "Charging completed" and "Other modes".

2. Charge switch operation

This is the switch used to select the battery connected to the tuner and the battery in the VTR.

The voltage at that time is set to max. 15.4V, the charge allowable current, max. 0.7A.

When using the tuner/timer as the battery charger, press the charge switch with the timer switch and the VTR power switch turned off; charging the battery connected to the tuner/timer is done. When a battery is not connected to the tuner, the battery inside the VTR is charged.

Completion of charging is detected by current flowing via the 15V/12V line.

The current flowing to the battery decreases when charging is completed; this is detected to reduce the voltage from 15.4V to 14.5V. When a battery is not connected, the charge current does not flow when the charge switch is pressed; the same operation as when charging is completed is performed.

Charge operation

(Charge start)

When the charge switch is pressed with the timer switch is set to OFF, Q911 is activated and then Q906 is activated. As a result, R917 and R915 of the voltage selector are grounded causing the output voltage to be 15.4V and allowable current 0.7A. The charge indicator is lit due to the activation of Q906.

(Charge completion)

When charging is completed, the potential difference across R902 becomes smaller. When the current at that time drops to approx. 100 mA, the output of Q2 in IC901 inverts to cut off Q906. So, R915 of the voltage selector is set open to drop the output voltage to 14.5V. The charge indicator goes off because Q906 is cut off.

(Charging the battery in the VTR)

Charging the battery in the VTR is basically the same as charging the battery connected to the tuner. However, the VTR power switch operation is ineffective in charging the battery connected to the tuner, but charging of the battery in the VTR is suspended by the VTR power switch operation. Q910 is activated to cut off Q911 when the power switch is operated. This is the same as the power operation previously described.

(Tuner charge and VTR charge)

The VTR power switch is ineffective during charging of the battery connected to the tuner. Charging the battery in the VTR is possible only when the VTR power switch is set to OFF.

When the battery connected to the tuner is charged, the VTR power switch operation becomes ineffective because the power supply line to the VTR is shut off by the battery charge jack.

In charging the battery in the VTR, the output voltage is set to 15.4V and charging is possible when the VTR power switch is set to OFF, but when it is set to ON, the charge switch line is shut off by "VTR ON: Hi" (because Q911 is cut off), and the output voltage is changed over to the VTR drive 12.5V.

When charging draws near to completion, the potential difference across R902 becomes smaller. When this potential difference becomes small enough to invert the output of IC901 pin 7 (charging completed), the output of pin 7 is set to Lo, Q906 is cut off regardless of the condition of the switch and R915 is set open. As a result, only R917 is kept grounded, so the output voltage is changed over to 14.5V.

Q911 is cut off and Q912 is activated in the modes (Charge switch: OFF) which are not concerned with charging.

By this, R964//R916 are grounded and the output voltage is changed over to 12.5V.

In timer recording related modes (timer switch: ON), D903 and D912 are activated by the timer switch operation to change over the output voltage to 12.4V.

3. Timer switch operation

When the timer switch is set to ON, the tuner/timer and VTR enter the record stand-by mode, the output voltage is changed over to 12.5V and it waits for the recording start. The power switch operation of the VTR and the charging operation are not accepted by means of the timer switch during this period.

The VTR operation starts, the allowable current is charged (1.5A to 4A) and generation of "T12V" is done by the output of the timer μ P at the recording start time, and the timer recording starts.

When the timer switch is set to ON, the output voltage is set to 12.5V and allowable current to 4A, and the charging operation and VTR operation are inhibited.

When the timer switch is set to ON, PG3 pin 9 is set to Lo and the timer indicator is lit. D910, D912 and D903 are activated. The allowable current is set to 4A by the activation of D910.

When D912 is activated, Q906 is cut off, R915 is open and R964//R916 are grounded by the activation of D903. So the output voltage observed at TP901 is set to 12.5V.

When the timer switch is set to ON, the charge switch is not grounded, so the battery which has been charged before the timer switch is set to ON is switched out the charge line and the charging is suspended.

Pin 5 (TIME ON) of the 10P DIN jack is set to Lo in the recording stand-by mode, so the power switch operation of the VTR during the timer switch ON period is inhibited by the system control circuit of the VTR, and the signal on the same line is set to Hi at the timer recording start time, and the power is turned ON.

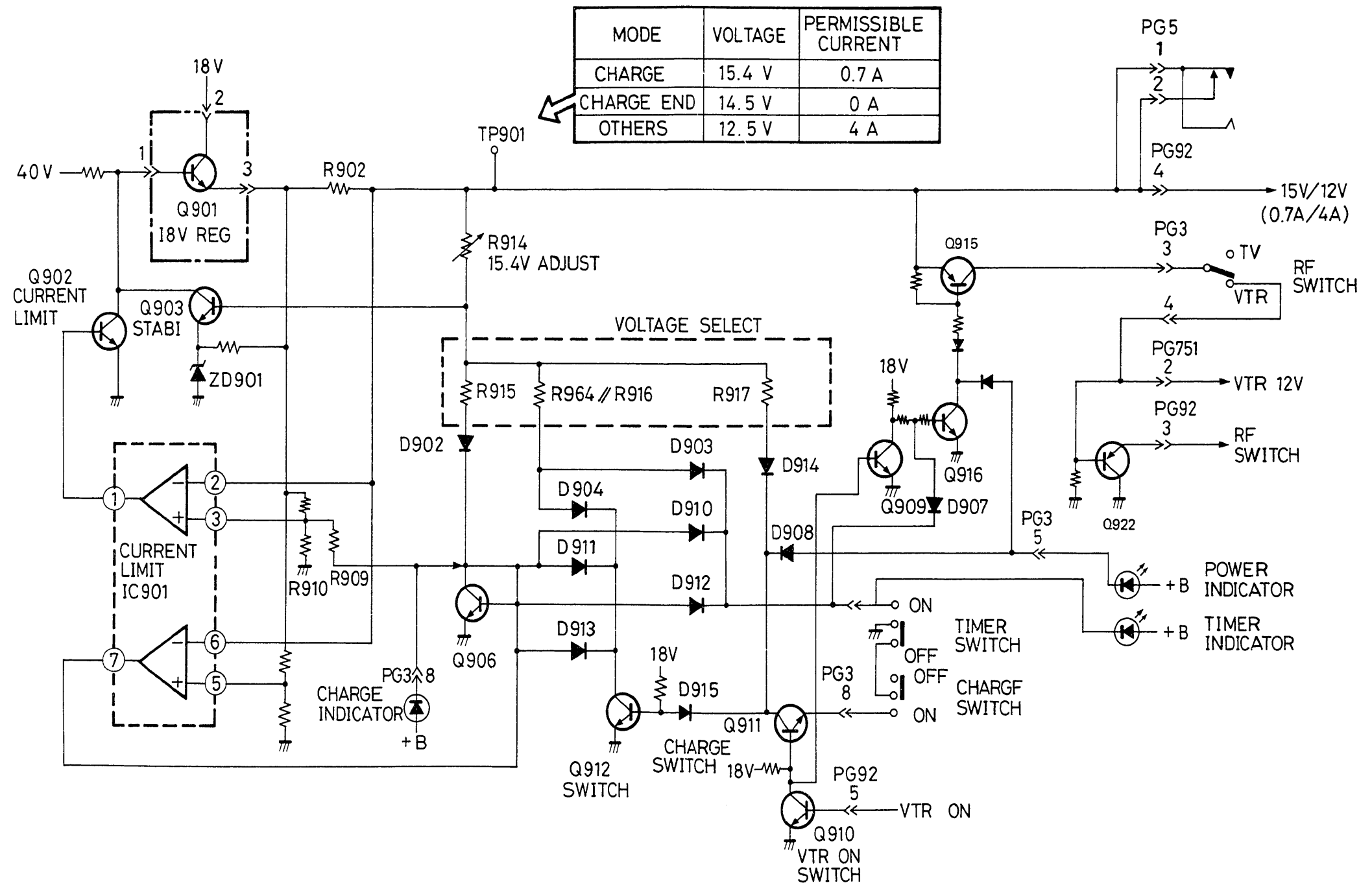


Fig. 6 Power circuit

TIMER

COMPOSITION OF TIMER

Fig. 1 shows the composition of the timer circuit.

The timer of this unit is composed of the power supply for the reset circuit, clock pulse generation circuit, backup circuit, etc., the timer recording controller, input key section, display controller and channel select circuit centering on the μ P which makes it possible to record 8 programs in the 3 weeks following setting.

[Display controller]

Refer to Fig. 1.

The display indicates the present time and the contents of the program. The 8 ϕ pulses output from pins 41 - 6 are applied to 8 grids and the segment drive outputs from pins 32 - 40 of the μ P are applied to the other segment pins. The indication of the display is of the dynamic drive type, and the segment of the digit synchronized with the 8 ϕ pulse is lit. The -30V power supply is applied to the filament pin of the display via ZD102 (5.6V) together with AC3V, and -30V is applied to the display control pin 14, to control the amplitude of the segment output. A dimmer switch is provided at this display control input pin; the voltage of the display control pin is raised by connecting R111 to the -30V line on the "DARK" side, to decrease luminance of the display.

10V power is always supplied to the colons of the display to keep them lit constantly.

Fig. 4 shows the relation between the input and output when the display indicates "SUNDAY AM 7:18".

The positive pulses are seen at the points where the output of pin 32 synchronizes with G5, G3, G2 as shown in the figure.

This pin is the output terminal which lights a segment, so every segment of G5, G3, G2 lights synchronizing with the grid pulse.

The lighting period of 1 segment is approx. 0.6 msec and this is repeated every 150 Hz.

[Power supply]

Refer to Fig. 2

The main power supply of the timer circuit is 10V; this is obtained by dropping 18V generated in the rectifier circuit board by IC101. This 10V is supplied to the remote control board, channel preset board and key board as their power supply.

[Reset]

Refer to Fig. 2

Q105 and ZD104 compose the reset circuit of the timer μ P; when the 10V power supply is generated, that is when the power plug is connected, the timer μ P is returned to the initial condition. In the initial stage of the timer μ P, the output which flashes "AM 0:00" is sent to the display. When 10V starts rising, Q105 is activated at the position

where the voltage is maximum, pin 15 is set to Lo and the μ P is reset.

A reset switch is provided at the base of Q105, and when the timer operates erroneously due to lightning, etc. (when the display performs abnormal indication), reset can be applied forcibly. (A backup circuit is provided to the timer, so reset may not be applied when the power plug is inserted and pulled out).

When the reset switch is pressed, Q105 is instantaneously cut off and pin 15 is set to Hi causing the μ P to be reset. When the reset switch is set open, the charging of C109 starts and Q105 is activated again after a certain time (this is determined by C109). Pin 15 is restored to Lo and the μ P performs operation after the reset is complete.

[Clock]

Refer to Fig. 2.

The clock pulse which is the reference signal of the μ P is the 50 Hz square wave pulse generated by IC104. IC104 is the 50 Hz generation module; it is reset when Hi output is applied to pin 4 and starts oscillation. This is amplified by Q104 and applied to pin 11 of the μ P. The μ P generates the display dynamic drive 8 ϕ pulse from the clock pulse. Fig. 3 shows the timing chart of the 8 ϕ pulse.

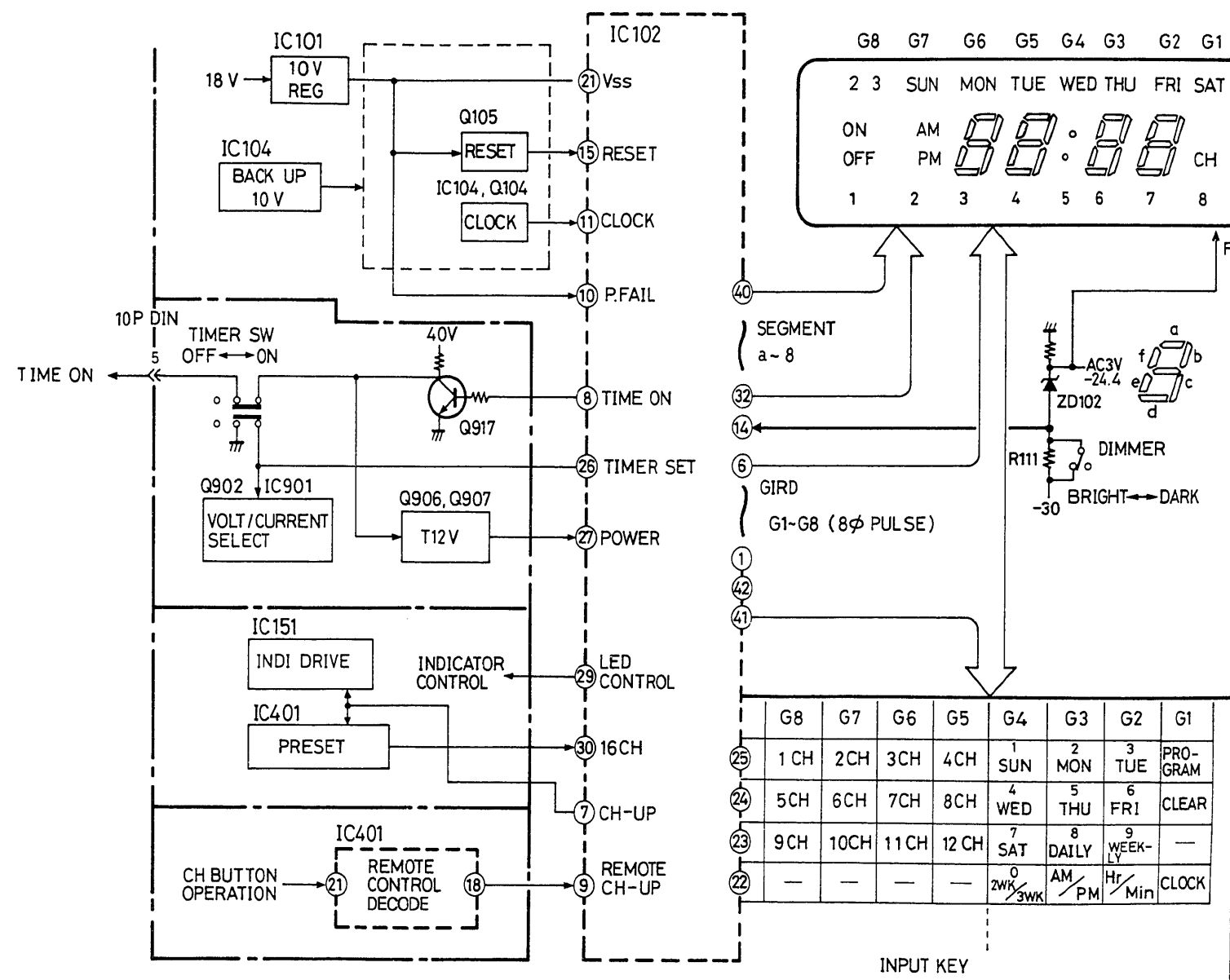


Fig. 1 Timer circuit composition

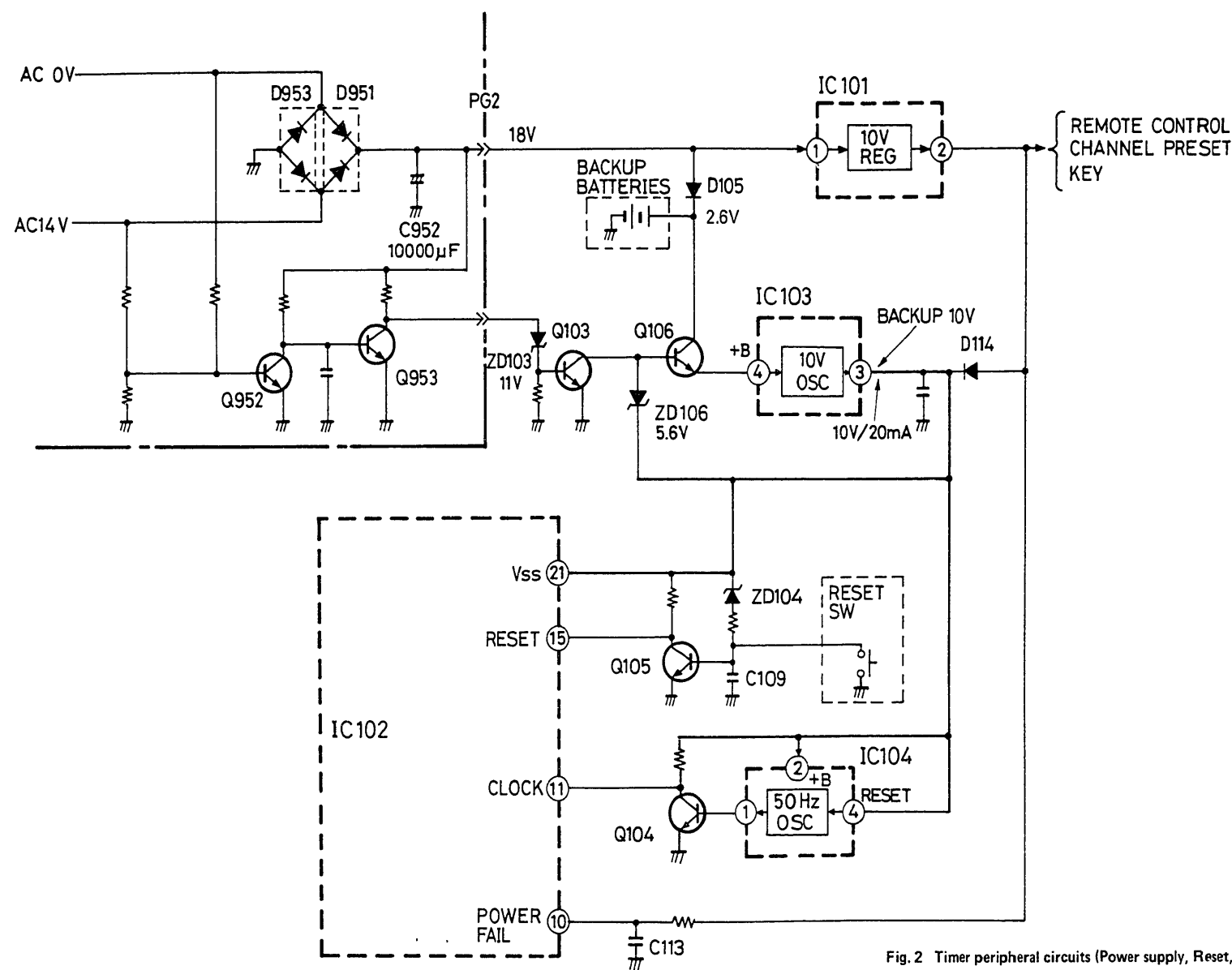


Fig. 2 Timer peripheral circuits (Power supply, Reset, clock and Back up circuits)

[Backup]

Refer to Fig. 2.

Backup of the timer circuit for max. 1 hr is performed during a power failure.

The backup circuit is a DC-DC converter which generates 10V using the battery which has been charged previously by the detection signal obtained with the power failure detection circuit (Q952, Q953), as its power supply.

The backup 10V is supplied to the μ P. Reset circuit, clock

circuit, bias circuit in the 16-CH signal system and the bias circuit in the time set signal system, among the timer circuit. This preserves the memory and time count inside the time μ P during a power failure.

Q952 is instantaneously cut off when a power failure occurs.

When Q952 is cut off, Q953 is activated by the discharge of C952. As a result, Q103 is cut off, Q106 is activated by ZD106 to couple the backup battery power to IC103.

[Input key section]

Refer to Fig. 1

The program input, channel selection and time setting key form the matrix as shown in the figure. By this, optional data can be memorized in the μ P.

Composition of the matrix is formed so that the 8 ϕ pulse output from pins 41 - 6 is applied to pins 22 - 25 via the switch.

G1 - G4 among the 8 ϕ pulses are allocated for program input, and G5 - G8, for time input. For example, when the "MON" or "1" button (same button) is pressed, the pulse of G4 is applied to pin 25 and the μ P memorizes it. When the input of pin 22 - pin 25 is the time set input, the μ P receives the input according to the sequence, and the output from the display segment of pins 32 - 40 corresponding to the input lights the display.

When the input is sent from the channel select button, the channel select pulse is output from pin 7 to select the specified channel.

[Timer recording controller]

Refer to Fig. 1.

When the timer switch is set to ON to start timer recording, the μ P inputs Lo to pin 26. By this, the timer μ P enters the timer stand-by mode. In the timer stand-by mode, pin 29 is set to Hi, the selected channel is moved to CH-16 and the output voltage of the regulator circuit is changed over to the operation voltage.

Pin 8 is set to Lo and Q917 is cut off at the recording start time. The timer record instruction (TIME ON: Hi) caused by this is output to the VTR via the switch and the VTR enters the timer recording mode as a result. This signal is applied to the "T12V" generation circuit (Q906, Q907) simultaneously at this time.

T12V obtained here is applied to the RF system, channel selector and pin 27 of the μ P. As a result, the tuner and the channel selector operate and the μ P automatically selects the channel previously preset for the timer recording.

IC103 boosts this 2.5V to 10V via DC-DC conversion and supplies it to the timer circuit. The backup battery is charged by D105 with 9 mA/2.5V in general.

The timer μ P inhibits the program input and stops the time display output during a power failure. 10V applied to pin 10 from IC101 and it is set to Lo during a power failure. This causes input/output to stop during the backup period.

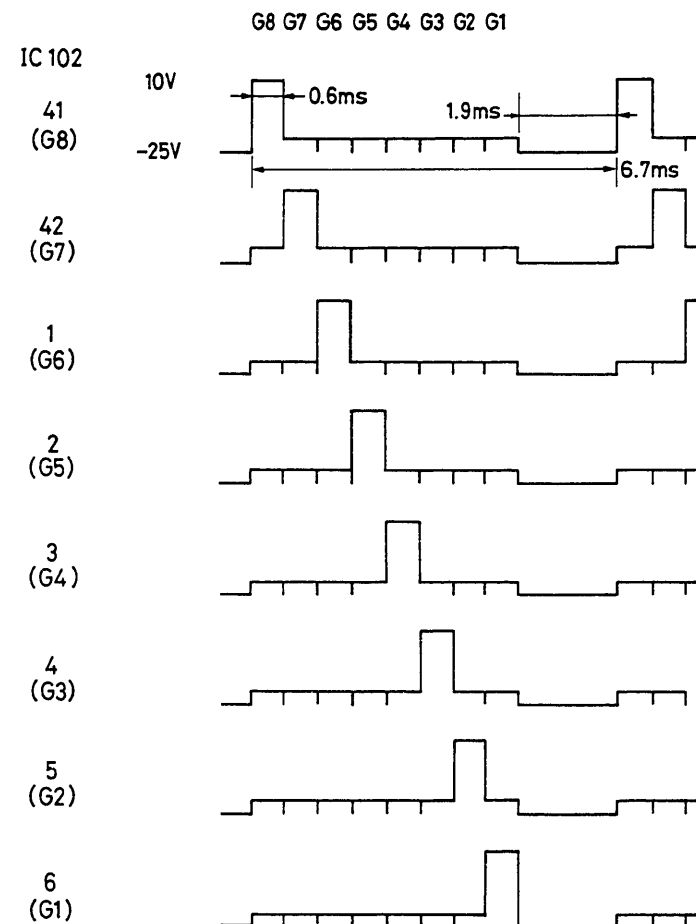


Fig. 3 8φ pulses

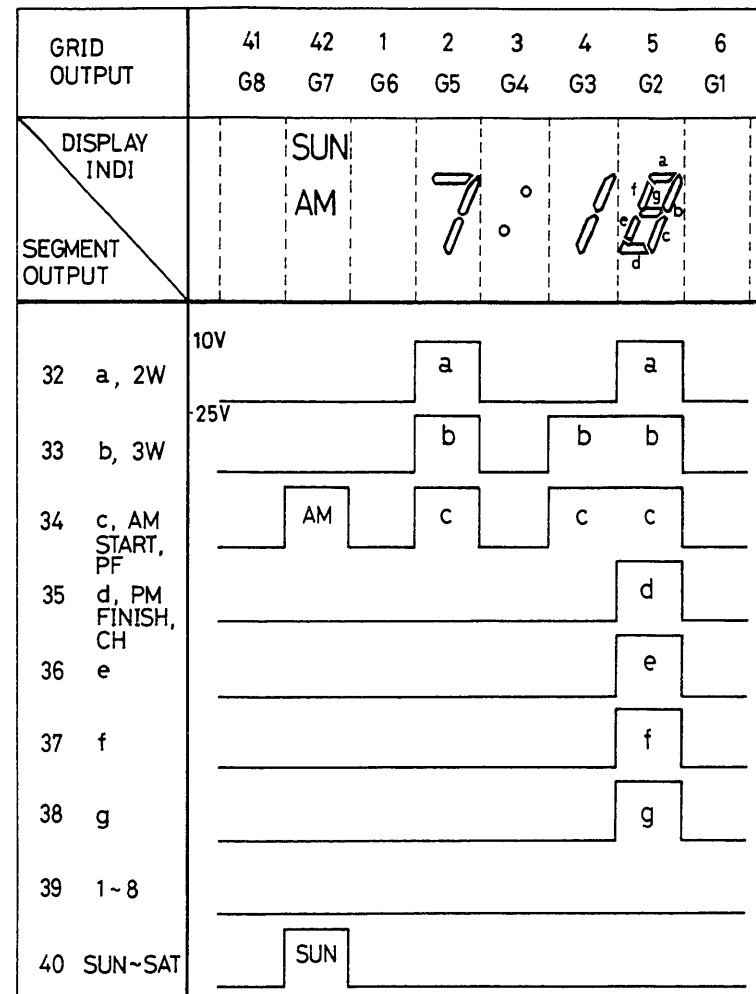


Fig. 4 "Sunday, AM 7:18" Display

[Channel select circuit]

The channel select circuit is composed of the indicator driver IC151, preset circuit IC701, remote channel select circuit IC104 and the channel select button circuit on the input key board as shown in the block diagram of the timer (Fig. 1).

Channel selection using the remote control button and the channel select buttons is possible but the channel select systems are different.

In channel selection using the remote control button, 1 shot pulse is output to pin 9 of the timer μ P from the remote control decoder IC401-pin 18 every button operation. The timer μ P receives this pulse and outputs 1 shot of the pulse (100 msec) for channel selection from pin 7 and advances the channel by 1 step.

In channel selection using the channel select buttons, when moving to another channel from the existing channel, it always enters channel selection via channel 16 (final channel).

Fig. 5 shows the channel select circuit.

When the channel select button is pressed, the number of pulses required for advancing the present channel (till it reaches CH-16) are output from pin 7 of the μ P.

This pulse is applied to the channel presetter circuit IC701-pin 16 and the channel indicator circuit IC151-pin 16. By this IC701 and IC151 perform the count-up operation reaching CH-16. When it reaches CH-16, pins 20 of IC701 and IC151 are set to Lo. As a result, when the channel preset circuit and the indicator circuit are synchronized, Q2 is activated and pin 30 of the timer μ P is set to Lo.

When the μ P receives Lo by pin 30, it detects that the final channel has been reached and stops the output of the carry-up pulse.

Then, numbers of pulses equivalent to the number of channels obtained by the channel select button operation are output from pin 7 and channel selection is completed.

Channel select defeat operation

Defeat of the audio IF system, defeat of AFS and switching off of the indicator are done during channel selection.

IC701 outputs the defeat pulse (negative) from pin 13 during channel selection. When this is applied to IC702-pin 10, the positive pulse (approx. 200 msec) is generated from pin 11. This is applied to the tuner/IF system and the key circuit board. The tuner/IF system performs defeat of the audio circuit and defeat of the AFS circuit.

Q152 on the key circuit board is activated to shut off the power supply to the indicator.

The tuning circuit and display circuit may not coincide electrically. The ICs are mutually synchronizing to prevent this.

When the tuning circuit passes CH-1 during channel selection, IC701-pin 11 is set to Lo, so the display circuit receives it by pins 15, 16 of IC151 to synchronize with CH-1. As a result, tuning and display can be matched by

By this, LD161 is lit, and D727 is activated to activate the transistor corresponding to the selected band inside IC702 and supplies the reception band power supply to the tuner. At the same time, the voltage previously set by the potentiometer is applied to the tuner via Q701 and the tuner receives the selected channel station.



[μ P reset]

When the batteries are installed with a button having been pressed, μ P is not reset and it sometimes malfunctions. To prevent this, Q3 is used to reset the μ P.

When the record button is pressed to reset the μ P, Q03 is activated and reset is applied to the μ P.

The carrier generator is suspended to release the HALT mode of the μ P during the reset operation.

Serial code

Fig. 3 shows generation of the code pulses.

The code pulses corresponding to the button operated forms the pulse-width modulated pulse group inside IC01. The pulse group appears with a period of 80 msec; the former 56 msec is the pulse group and the latter 24 msec a space.

The PWM pulse appearing in this 56 msec is a 16-bit signal with the period of 3.5 msec, and is composed of "0" code (width: 1 msec, space: 2.5 msec) and "1" code (width: 2.4 msec, space: 1.1 msec). The first 7 bits out of the 16 bits are operation button bits and the last 9 bits are the custom code (all set to "1" in this system).

RECEIVER OPERATION

Figs. 4 and 5 are block diagrams of the receiver.

The receiver receives infrared rays output from the transmitter, demodulates them and obtains the code pulse by a reverse operation to the transmitter, that is via the carrier. This pulse is encoded, applied to the ladder circuit and the analog signal with the same level as that obtained when the operation button is pressed is derived.

The operation mode data from this signal is applied to the system control circuit to drive the VTR.

Data concerning the slow tracking control and slow speed control are supplied to the servo system to control the slow mode.

Infrared rays transmitted from the transmitter are received by the photo diode. These are amplified/detected by Q1401 - Q1405, and formed to the code pulses by IC1401. The pulses are decoded by IC401. IC401 receives the code pulse from pin 21 and counts it by the internal 1st and 2nd counters. These counters count the 1st group and 2nd group of the serial signal (code pulses) independently, and compare the obtained data using the coincidence detection circuit. When the data obtained from the 1st and 2nd counters are the same, this detector circuit assumes the data

SERIAL CODE LIST

Operation mode	Symbol	Serial code									Resistance coupled to IC406 pin 1
		1	2	3	4	5	6	7	8 ~16		
Reverse search	◀ SEARCH	0	0	0	1	0	0	0	1	6.4 (kΩ)	
Forward search	SEARCH ▶▶	0	0	1	0	0	0	0	1	8.5	
Slow	SLOW	0	1	0	0	0	0	0	1	15.4	
Channel	CHANNEL	0	1	0	1	0	0	0	1	—	
Rewind	REWIND	0	1	1	0	0	0	0	1	3.4	
Fast forward	F. FWD	0	1	1	1	0	0	0	1	4.7	
Stop	STOP	1	0	0	0	0	0	0	1	2.3	
Pause	PAUSE	1	0	0	1	0	0	0	1	0	
Power supply	POWER	1	0	1	1	0	0	0	1	—	
Tracking ▲	TRACKING ▲	1	1	0	0	0	0	0	1	—	
Tracking ▼	TRACKING ▼	1	1	0	1	0	0	0	1	—	
Variable slow speed ▲ (faster)	SLOWSPEED ▲	1	1	1	0	0	0	0	1	—	
Variable slow speed ▼ (slower)	SLOWSPEED ▼	1	1	1	0	0	0	0	1	—	
Frame advance	F. ADVANCE	0	0	0	0	0	0	1	1	21.4	
Play	PLAY	0	0	0	0	1	0	1	1	111.4	
Audio dub	DUB	0	0	0	0	1	0	1	1	31.4	
Recording	RECORD	0	0	0	0	1	1	0	1	51.4	

to be normal and outputs it to the decoder in the next stage to convert it into 14 parallel signals.

IC401 decodes the serial code pulse obtained by pin 21 to the signals of 5 systems shown below.

1. **Channel select signal:** This is output from IC401 pin 17 and supplied to the channel indicator circuit and tuning circuit via the clock controlling μP . This changes the channel number in the UP direction corresponding to the number of times the button is operated and lighting the indicator of the reception channel is done.

When the channel-up code is input to pin 21, pin 18 outputs the square pulse (10Vp-p) with one button operation. This pulse is supplied to the channel indicator circuit and the tuning circuit via the timer μP to advance the channel by one step.

2. **Remote power signal:** This signal is output from IC401 pin 20 and supplied to the system control circuit of the VTR via pin 7 of the tuner/adaptor 10P DIN connector. This signal is coupled in parallel with the power switch on the front panel of the VTR, and makes possible the power control of the VTR by the power button on the remote control unit, the same as the switch on the VTR. Pin 20 is set to Hi during the button operation period. This Hi activates Q404 and sets the collector of Q404 to Lo. This Lo signal is sent to the VTR via PG8 pin 2 and 10P DIN cord pin 7 of the tuner/adaptor.

This line is connected in parallel to the power switch of the VTR, and the same effect as that of the power switch operation on the VTR can be obtained.

When the power is supplied to the VTR, Q404 is cut off after the button operation, but the remote power control line is kept at Lo by the power hold operation of the system control circuit of the VTR. With the remote power button pressed, IC401 pin 20 outputs the Hi pulse when the power is cut off by the remote control operation. By this, Q404 is activated and the power supply of the VTR is shut off in the same way as in the VTR power switch operation.

3. **Mode control signals:** The parallel signals at IC401 pins 1 - 4 are converted into 11 parallel signals by the converter IC402.

This drives the D/A converter IC406 and the analog signal corresponding to the operation mode can be obtained at pin 1. This analog signal is sent to the system control circuit inside the VTR from the tuner/adaptor using the remote cord. This signal is compared by IC806 on the system control circuit board and inputs the mode corresponding to the transmitter operation to IC801 pin 38.

4. **Slow tracking control signal:** The parallel signals at IC401 pins 10 - 16 are converted by the converter composed of IC403, IC404, and the D/A converter, IC407 is driven by this to obtain the slow tracking control signal from pin 1. This is supplied to the servo circuit of the VTR using the remote cord. Slow tracking control is done by changing the resistance of IC407 pin 1.

This change is obtained by operating the electronic switch composed of IC403, IC404 using the 5-bit output of IC401 pins 10 - 13, 16.

The slow tracking is controlled in 32 steps; in the initial state, all IC401 pins 10 - 13 are set to Hi (10V), and pin 16, Lo, and the resistance coupled to IC407 pin 1 is set to 99 k Ω at that time.

As a result, 16 steps are obtained in the up direction (▲) and 15 steps in the down direction (▼), totalling 32 steps.

In the lowest step (▼) mode, all the pins 10 - 13 and 16 are set to Lo and the resistance at pin 1 is 189 k Ω .

In the highest step (▲) mode, all the pins 10 - 13, 16 are set to Hi (10V) and the resistance at pin 1 is 3 k Ω .

The 32 steps are formed by adjusting the resistance at 6 k Ω intervals.

5. **Slow speed control signal:** The parallel signals from IC401 pins 6 - 8 is converted by the converter IC405 to drive the D/A converter IC407 as in the slow tracking control. The signal thus obtained is supplied to the servo circuit of the VTR using the remote cord.

The slow speed control output is produced by varying the resistance coupled to pin 14 of IC407 by the electronic switch, IC405 and the 3-bit output from IC401 pins 6 - 8.

The 3-bit output drives IC407 pins 7 - 9, 11 - 13 indirectly enabling the 8-step speed control.

The variable ranges of slow speed are 1/30 - 1/10 (SP mode) and 1/30 - 1/5 (EP mode).

This speed difference between SP and EP is done by the remote control circuit on the servo circuit board within the VTR.

IC407-pin 14 is set to 0 k Ω at max. slow speed and 192 k Ω at min. slow speed, and the interval between them is divided into 6 steps, providing a total of 8 steps. The initial output of the slow speed control circuit is designed so that max. speed is obtained at 0 k Ω .

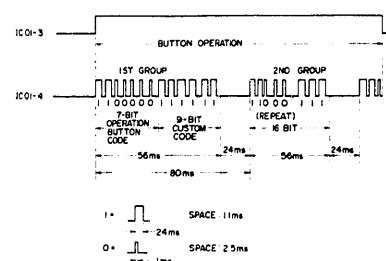


Fig. 3 Code pulse generation

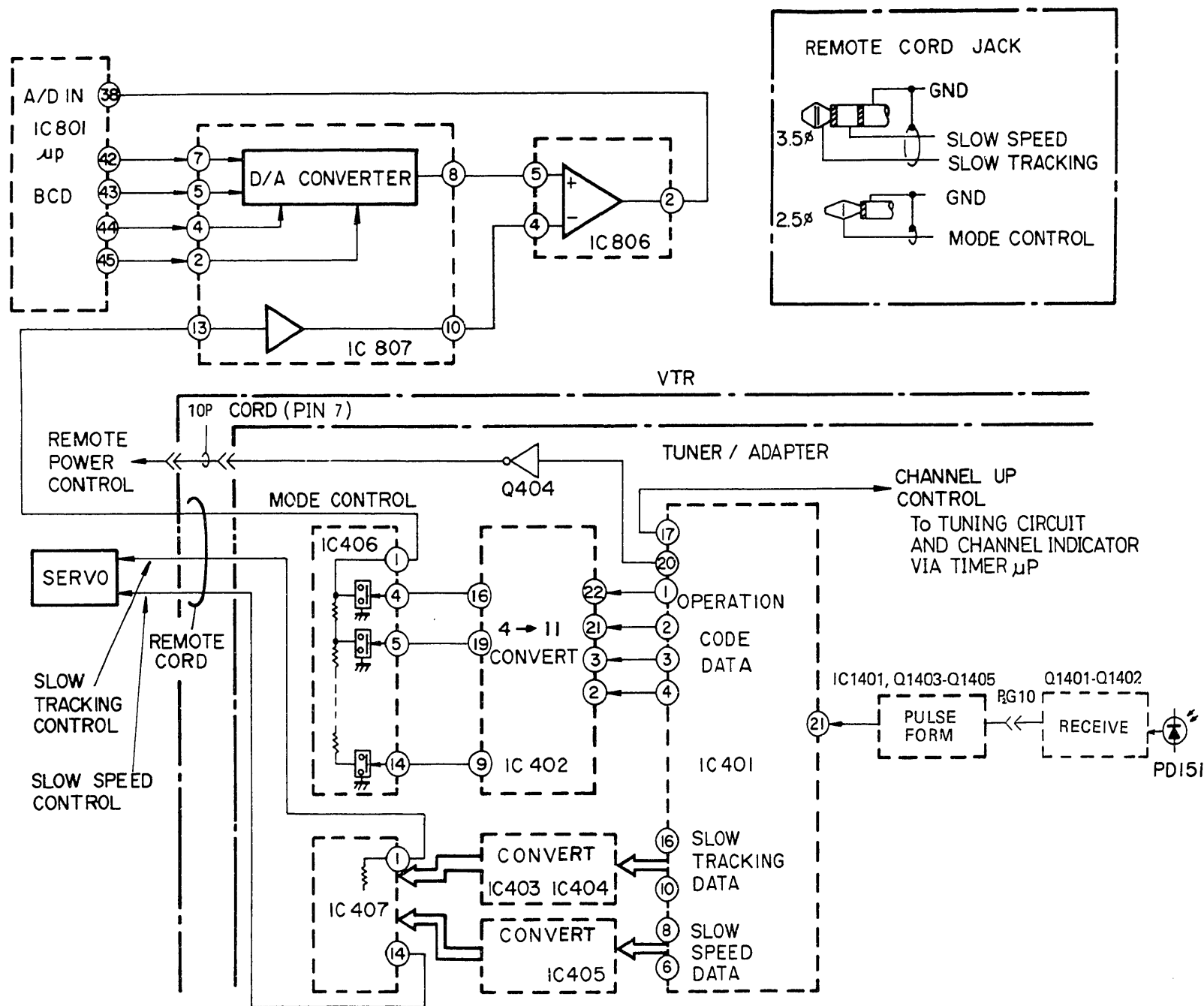


Fig. 4 Remote Control Block Diagram

SLOW TRACKING OUTPUT

No. of Button Operation	IC401 Pins					IC407 pins 1
	16	13	12	11	10	
15	0	0	0	0	0	189
14	0	0	0	0	1	183
13	0	0	0	1	0	177
12	0	0	0	1	1	171
11	0	0	1	0	0	165
10	0	0	1	0	1	159
9	0	0	1	1	0	153
8	0	0	1	1	1	147
7	0	1	0	0	0	141
6	0	1	0	0	1	135
5	0	1	0	1	0	129
4	0	1	0	1	1	123
3	0	1	1	0	0	117
2	0	1	1	0	1	111
1	0	1	1	1	0	105
Initial state	0	1	1	1	1	99

1 : 10V
0 : 0V

NOISE BAR UP: ↑
NOISE BAR DOWN: ↓

SLOW SPEED OUTPUT

	IC401 Pins			IC407 Pin
	8	7	6	14
7	0	0	0	192
6	0	0	1	130
5	0	1	0	93
4	0	1	1	66
3	1	0	0	36
2	1	1	0	24
1	1	1	0	12
Initial state	1	1	1	0

Faster ↑
Slower ↓

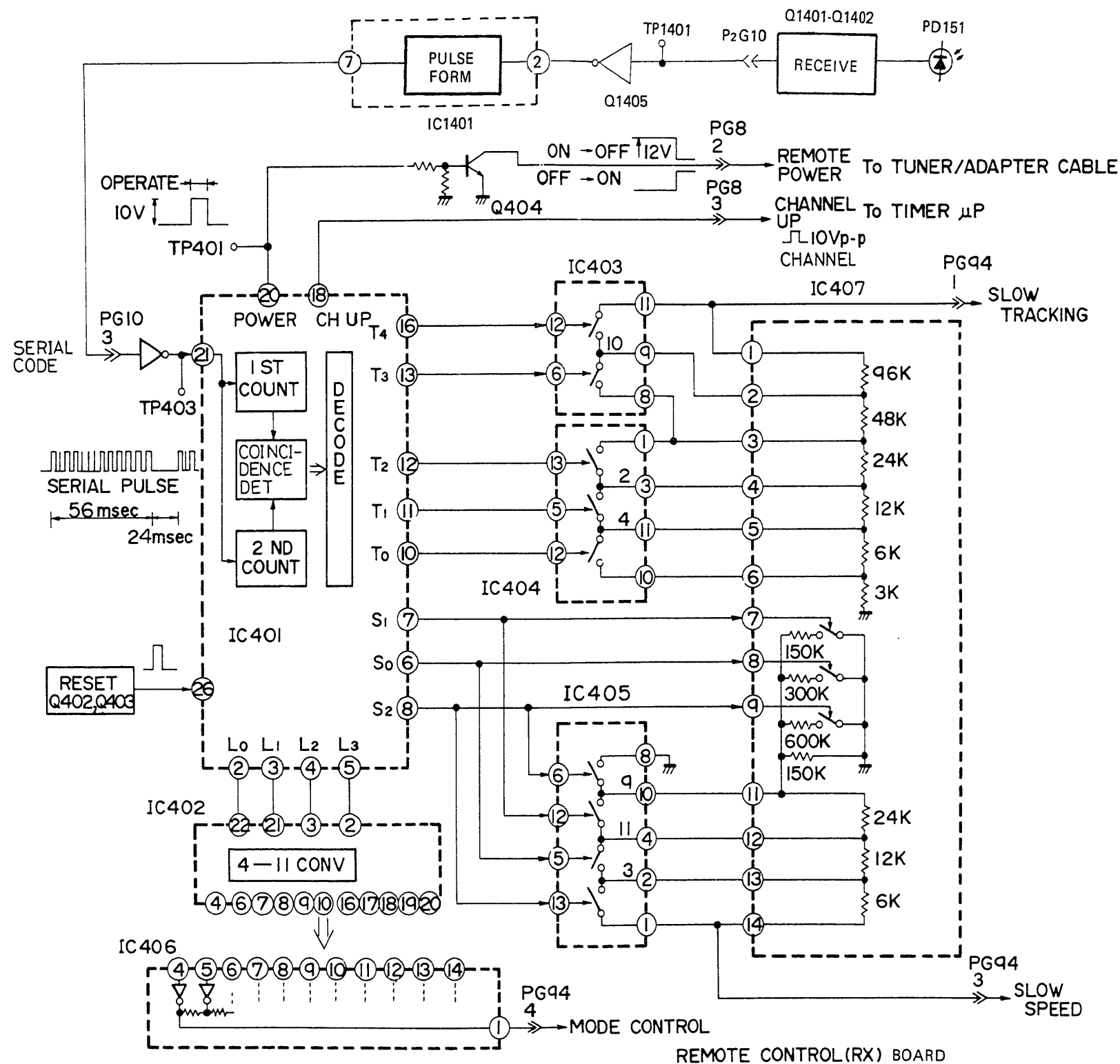


Fig. 5 Remote Control Receiver Block Diagram

IC PIN SPECIFICATIONS

ICs described:	HD44820A48	IC901 (SYSTEM CONTROL)
	HA11727	IC506 (SERVO)
	BA847	IC509 (SERVO)
	HD44700A08	IC01 (REMOTE CONTROL)
	μ PD554C-90	IC401 (REMOTE CONTROL)
	HD38800A62	IC201 (TIMER)

How to read the table

Pin	I/O	Active level	Abbreviation	Function

Pin No.

Input/output pin
I: Input
O: Output
I/O: In common for input/output

Level in execution of specified operation
Hi, Lo

Abbreviation of operation executed during input/output

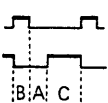
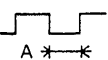
Data concerning the input and output, and the operation following it.

SYSTEM CONTROL IC (IC901) PIN SPECIFICATIONS

HD44820A48

Function: VTR system control

Pin	I/O	Active Level	Abbreviation	Function	
1			LOAD	Loading motor control outputs	Forward rotation (loading)
2			UNLOAD		Reverse rotation (unloading)
3			SLACK REW	Reel motor control outputs	Slack removing reverse rotation.
4	O	Lo	SEARCH REW		Reverse rotation for reverse search. (Both pins 3, 4: Reverse rotation for rewind at Lo.)
5			F. FWD		Forward rotation for forward search.
6	O	Lo	NO-STANDARD PB (SPEED PLAY)	Output during play at other speeds than the standard speeds (SP, LP, EP).	
7	O	Hi	OSC STOP	Bias oscillation stop control output. When recording, audio dubbing: Lo.	
8	O	Lo	MUTE	Audio muting control output during Loading/Unloading, Variable speed play.	
9	O	Lo	CYL ON	Cylinder start output.	
10	O	Lo	REVERSE	Capstan motor reverse rotation output. During reverse search, phase-matching: Lo.	
11	O	Lo	LOADING	Monitor-cut output during loading, dubbing pause.	
12			PAUSE	Operation mode control outputs.	Pause output.
13			MODE 1		Play/Dubbing output.
14	O	Lo	MCDE 2		Record/Dubbing output.
15			MODE 3		Frame-advance/Search output.
16			MODE 4		Slow/Search output.
17	I/O	Lo	V. DUB	Video dubbing (insert) mode control input/output. Operation input/display output.	
18	I	Hi	CAMERA	Camera connection input. For record check and camera pause. (pause of VTR is ineffective.)	
19	I	Lo	C. PAUSE	Pause control input by camera.	
20	I	Lo	MEMORY	Tape count finish detection input. "9999" is effective during rewind and insert modes.	
21	I	Hi	RESET	Reset input of μ P.	
22	I	Lo	GND	GND of μ P.	
27	I	5V	Vcc	Power input of μ P.	
28	I	Lo	TIME ON	Timer-recording execution input.	
29	I	Hi	STAND-BY	Camera stand-by input. Power save (when battery is used) instruction.	
30	I	Lo	BATTERY	Battery power detection. Power save: With Lo, 5 minutes after record pause. Power off: With Lo, 5 minutes after stop.	

Pin	I/O	Active Level	Abbreviation	Function	
31	I	Lo	POWER ON	When the power switch is set to ON, this pin is set to Lo and the μ P performs the power relay hold operation.	
32	I	Lo	STATE 1	Mechanism state input	Stop/F. FWD
33			STATE 2		F. FWD/Pause/Play
34			STATE 3		Play/Slow
				Note: REW is the same as F. FWD. Record, Dubbing are the same as Play, and Frame-advance, Still the same as Slow.	
35	I	Lo	DEW	Condensation detection input. Set the VTR to Stop mode and inhibits Operation input. Flashes Stop display.	
36	I	Hi	REW END	Rewind end detection input. During Rewind: Stop During Reverse search: Play	
37	I	Hi	FWD END	Forward end detection input. Set the VTR to Stop mode.	
38	I	Hi	REMOTE	Remote control operation input. Sets to Remote control operation mode and performs A/D conversion together with the outputs of pins 42 – 45.	
39	I/O	Lo (DIGIT)	PAUSE	Operation inputs & operation display outputs	Pause mode
40			A. DUB		Dubbing mode
41			REC		Record mode
42			PLAY		Play mode
43			F. FWD		F. FWD mode
44			STOP		Stop mode
45			REW		Rewind mode
46	O		PHASE 1	Operation input/output timing pulses (400Hz). A: Remote control operation input period. B: Operation button input period. C: Indicator lighting period.	
47	O		PHASE 2		
48	O	Lo	SAVE	Save instruction output. Reduces power consumption to 1/5 when the battery power is used, during the camera stand-by mode, or 5 minutes after the record pause mode is entered.	
49	O	Hi	V. DUB	Video dub (insert) instruction output.	
50	I	Lo	CASSETTE	Cassette holder condition input (Lo: Down). When it is set to Hi, operation button input is not accepted.	
51	I	—	SAFETY TAB	Safety Tab presence/absence detection input. Lo: Record, Dubbing inhibited (The VTR enters the play mode during timer recording). Hi: Recording possible (Tab present).	
52	I	Hi	CYL LOCK	Reduced cylinder speed detection input. Hi: The VTR enters the Stop mode.	
53	I		REEL LOCK	Tape running abnormal stop detection input. The VTR enters the stop mode with A > 3 sec. in the standard play mode, and enters the Stop mode with A > 1.5 sec. in the F. FWD, Rewind and Search modes.	

Abbreviation and pin		Mechanism			Motor operation					Signal control							Mode control				
		STATE			LOAD	UNL	REW SLACK	REW SEARCH	F. FWD	N.SPB	OSC STOP	MUTE	CYL ON	REV	LOADING	PAUSE	MODE				V. DUB
		1	2	3													1	2	3	4	
VTR operation		32	33	34	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	49
Operation mode	Stop	Lo																			
	Pause	Lo																			
	F. FWD	Lo	Lo						Lo												
	Rewind	Lo	Lo				Lo	Lo													
	Play		Lo	Lo									Lo				Lo				
			Lo	Lo					Lo		Lo	Lo					Lo		Lo	Lo	
			Lo	Lo			Lo	Lo		Lo	Lo	Lo					Lo		Lo	Lo	
				Lo					Lo			Lo					Lo			Lo	
				Lo					Lo								Lo		Lo		
				Lo					Lo								Lo		Lo		
	Record		Lo	Lo							(Lo)	Lo					Lo				
			Lo								(Lo)	Lo				Lo	Lo				
			Lo	Lo							(Lo)	Lo					Lo			Lo	
	Dubbing		Lo	Lo							(Lo)	Lo					Lo	Lo			
			Lo								(Lo)	Lo				Lo	Lo	Lo			
			Lo	Lo							(Lo)	Lo					Lo	Lo			
Transient mode	Loading	Note-1			Lo							Lo	Lo		Lo						
	Unloading					Lo	Lo					Lo									

Hi, Lo are active levels.
However, Lo inside () shows the non-active level.

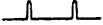
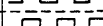
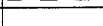
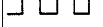
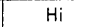
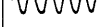
Note-1: Each pin outputs according to the above table when the VTR passes through each mechanism state position, STOP → F. FWD → PAUSE → PLAY → SLOW.
All the pins are set at Hi in the mechanism transient period.

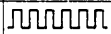
CYLINDER/CAPSTAN SERVO IC (IC506) PIN SPECIFICATIONS

HA11727

Function: Digital servo circuit

- Cylinder phase control circuit
- Capstan speed control circuit
- Capstan phase control circuit

Pin	I/O	Active Level	Abbreviation	Function
1	I	—	MM	Tach pulse monostable multivibrator (MM) time constant set pin. This MM delays the tach pulse and determines the fall of SW30Hz pulse in CH-1.
2	I		CYL TACH	Cylinder tach pulse input pin.
3	I	Hi	SW30	Sets the duty of the PWM wave generated in the both phase control systems to 50% when receiving Hi.
	O			SW30Hz pulse output pin.
4	O		CYL PHASE	Cylinder phase control output pin. 874Hz PWM wave.
5	I	Hi	REC CTL INHIBIT	Inhibits the recording of the CTL pulse with Hi input.
6	O		CYL SPEED	Output pin of cylinder speed control output.
7	I		CYL SPEED	Input pin of cylinder speed control output. This is grounded when Hi is applied to pin 9.
8	I		SAWTOOTH	Short-circuits cylinder speed control sawtooth wave. This is grounded when Hi is applied to pin 9.
9	I	Hi	CYL CONTROL	Cylinder speed control system control input pin. When Hi is applied, the input pin (pin 7) of the control output of the cylinder speed control system and the sawtooth wave line (pin 8) are grounded.
10	I		3.58MHz	Servo circuit reference signal, clock pulse generation source signal input pin. Divides 3.58MHz to produce the reference signal REF30, clock pulse 447kHz.
11	I		V. SYNC	Vertical sync signal (60Hz) input pin. 30Hz is obtained by dividing 60Hz.
12	I	Lo	GND	GND
13	I		R/P CTL	CTL pulse input pin during play.
	O			CTL pulse output pin during recording.
14	I		CTL NFB	Negative feedback circuit pins of the CTL amp.
15	O			
16	I	Hi	Vcc	Power input pin, 9V.
17	I		CFG	Capstan FG (CFG) input pin. SP: 240Hz, LP: 360Hz, EP: 720Hz
18	I		CFG NFB	Negative feedback circuit pins of the CFG amp.
19	O			

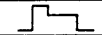
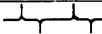
Pin	I/O	Active Level	Abbreviation	Function
20	I	Hi	SEARCH	Search mode input pin. Varies the frequency of the reference signal when Hi is applied. (becomes higher) VTR enters the forward search mode when pin 21 is set to Lo and pin 20 to Hi.
	O	Lo		Phase-matching brake pulse output pin during phase-matching operation. Negative pulse equivalent to phase difference between the vertical sync signal and CTL pulse.
21	I	—	TRACKING	Time constant set pin of the tracking monostable multivibrator and reverse search mode input pin.
		Hi		VTR enters the reverse search mode when Hi is applied to this pin and pin 20 simultaneously.
22	O		CAPSTAN SPEED	Capstan speed control output pin. 3.5kHz PWM wave.
23	O		CAPSTAN PHASE	Capstan phase control output pin. PWM wave with the frequency 1748Hz in SP, 874Hz in LP and 473Hz in SLP.
24	I	—	PB/REC	Record, play, assemble mode input pin.
		Hi		Open: Record mode. Hi: Play mode.
		Lo		Lo: Assemble mode (phase-matching, insert). Controls comparing the play CTL pulse and vertical sync signal.
25	I	—	SP/LP/EP	Tape speed input pin. Changes over the servo circuit as shown below depending on the input level. 1V – 4V: SP, Lo: LP, 4V or more: EP.
26	I	—	FAST/SLOW	Play tape speed input pin. Performs Fast (double speed), Slow (1/2 speed) playback depending on the input level. Vcc: Fast, 1/2Vcc: Slow.
27	I	Hi	5V	Power input pin of PWM generator.
28	I	—	NTSC/PAL	NTSC/PAL select input pin. Lo: NTSC, Hi: PAL

CAPSTAN DRIVE TIMING CONTROL IC (IC509) PIN SPECIFICATIONS

BA847

Functions: Slow, Still, Frame-advance circuits and Phase-matching circuit

Pin	I/O	Active Level	Abbreviation	Function
1	I	Hi	SLOW/F. ADV	Slow, Frame-advance mode input pin. Changes over inside to the slow format.
2	I	Vcc/2	PAUSE/STILL	Phase-matching control pin.
		Vcc		Still mode input pin.
3	I	—	MM6	Time constant set pin of MM6. MM6 generates the pulse for slow operation until a stabilized still picture is obtained at the beginning of still play.
4	I	—	MM7	Time constant set pin of MM7. MM7 generates the stop time control pulse to control the slow speed.
5	I	—	MM8	Time constant set pin of MM8. MM8 shapes the CTL pulse fed from pin 19 to remove the noise component in the pulse.
6	I	—	MM9	Time constant set pin of MM9. MM9 generates the pulse which enables to start recording after a certain period when phase-matching with a tape on which CTL pulses are not recorded. MM9 is triggered when pause is released.
7	O	Hi	REC START	Phase-matching control output pin. Controls record inhibition of the video signal system during the phase-matching period.
8	I	Hi-Lo	U/D COUNT	Phase-matching counter control pin. Hi: UP counter. Lo: DOWN counter
9	O		REC CTL	CTL pulse output pin during recording.
10	I	—	MM5	Time constant set pin of MM5. MM5 determines the output period of the capstan drive pulse during slow playback. MM5 determines the duty of the CTL pulse during recording.
11	I	Lo	GND	GND
12	I	—	MM4	Time constant set pin of MM4. MM4 delays the CTL pulse during recording.
13	O		R/P CTL	Output pin of CTL pulse applied to IC from pin 19 during playback.
	I			Input pin of CTL pulse during recording.
14	O	Lo	BRAKE	Brake pulse output pin.
15	I	—	MM3	Time constant set pin of MM3. MM3 forms brake pulse from the CTL pulse.
16	I	—	MM2	Time constant set pin of MM2. MM2 delays the play CTL pulse. Slow tracking control pin.

Pin	I/O	Active Level	Abbreviation	Function
17	O	Lo	SLOW/STILL	Slow, Still, Frame-advance cancel output pin. Set to Lo in any of the above modes.
18	O		RUN/STOP	Capstan motor drive pulse output pin.
19	I		PB CTL	Play CTL pulse input pin.
20	I	—	MM1	Time constant set pin of MM1. MM1 generates the capstan motor start trigger pulse from SW30Hz.
21	I		SW30	SW30Hz pulse input pin.
22	I	Hi	Vcc	Power input pin (9V).

REMOTE CONTROL TRANSMITTER IC (IC01) PIN SPECIFICATIONS

HD44700A08

Function: Remote control transmission signal encoder

Pin	I/O	Active Level	Abbreviation	Function
3	O	Hi	OPERATION	Transmission period pulse. Outputs the pulse (width: 56msec, period: 80msec) only when a key is set to ON.
4	O	Hi	SERIAL OUT	Serial signal output pin. Outputs the serial signal corresponding to the key when the μ P inputs button operation. The codes from 1st bit to 7th bit of the serial signal corresponding to the key input which is received by this pin is shown in Table A.
5	I	Lo	REC MODE	Inputs the record button operation. Judges the record mode together with the play button operation.
6	I	Lo	DUB MODE	Inputs the audio dub button operation. Judges the audio dub mode together with the play button operation.
7	I	—	MODE SW	PWM selector inputs. The modulation system of the serial pulse is changed to PWM (Pulse Width Modulation) by this pin. Pin 7 is set to Lo, and pin 8, to Hi because the PWM system is used in this unit.
8	I	—		
9	I	Lo	RESET	Clears RAM of μ P. Reset is performed when the batteries are inserted.
10	I	Lo	GND	GND of μ P.
11	—		OSC 1	Clock frequency set pins of μ P. (200kHz)
12	—		OSC 2	
13	I	Hi	HLT	μ P operation input. Operates μ P only when an operation button is pressed. When button operation is done, the μ P inputs the key at Hi. When the button operation is not done, the μ P enters the stand-by mode at Lo.

Pin	I/O	Active Level	Abbreviation	Function
14	I	Hi	Vcc	Power supply of μ P.
15	O	Hi	1G	Key discrimination signal outputs. Hi outputs regardless of the μ P operation. μ P detects the operation mode by the pin to which this output is fed.
16			2G	
17			3G	
18			4G	
19	I	Hi	MATRIX 1	Key inputs. The operation mode is determined by the key input to which the key discrimination signal output from pins 15 — 18 is fed via the operation button.
20			MATRIX 2	
21			MATRIX 3	
22			MATRIX 4	
23			MATRIX 5	

	I/O	μ P			
		15	16	17	18
μ P	19	Frame-advance	◀ Search	Search ▶	
	20	Slow	Channel	Rewind	F. FWD
	21	Stop	Pause		ON/OFF
	22	Tracking ▲	Tracking ▼	Speed ▲	Speed ▼
	23	Play			

Table A SERIAL CODE LIST

Operation mode	Symbol	Serial code							
		1	2	3	4	5	6	7	8 ~ 16
Reverse search	◀ SEARCH	0	0	0	1	0	0	0	1
Forward search	SEARCH ▶	0	0	1	0	0	0	0	1
Slow	SLOW	0	1	0	0	0	0	0	1
Channel	CHANNEL	0	1	0	1	0	0	0	1
Rewind	REWIND	0	1	1	0	0	0	0	1
F. FWD	F. FWD	0	1	1	1	0	0	0	1
Stop	STOP	1	0	0	0	0	0	0	1
Pause	PAUSE	1	0	0	1	0	0	0	1
Power supply	POWER	1	0	1	1	0	0	0	1
Slow tracking ▲	TRACKING ▲	1	1	0	0	0	0	0	1
Slow tracking ▼	TRACKING ▼	1	1	0	1	0	0	0	1
Slow speed (gets faster) ▲	SLOW SPEED ▲	1	1	1	0	0	0	0	1
Slow speed (gets slower) ▼	SLOW SPEED ▼	1	1	1	1	0	0	0	1
Frame-advance	F. ADVANCE	0	0	0	0	0	0	1	1
Play	PLAY	0	0	0	0	1	0	0	1
Dubbing	DUB	0	0	0	0	1	0	1	1
Record	RECORD	0	0	0	0	1	1	0	1

REMOTE CONTROL RECEIVER IC (IC401) PIN SPECIFICATIONS

μPD554C-90

Function: Remote control reception signal decoder

Pin	I/O	Active Level	Abbreviation	Function
28	—	—	CLK	External oscillator connection pins.
2	O	Hi	L ₀	Output pins with the operation mode decoded to 4 bits. Output as shown in Table A corresponding to the operation mode.
3			L ₁	
4			L ₂	
5			L ₃	
6	O	Hi	S ₀	Output pins with the slow speed decoded to 4 bits. Output as shown in Table B corresponding to the slow speed button operation. Speed varies by up to 16 steps max.
7			S ₁	
8			S ₂	
9			S ₃	
10	O	Hi	T ₀	Output pins with the slow tracking decoded to 6 bits. Output as shown in Table C corresponding to the slow tracking button operation.
11			T ₁	
12			T ₂	
13			T ₃	
16			T ₄	
17			T ₅	
14	I	10V	Vss	Power input pin.
18	O	Hi	CH-UP	Outputs channel up signal corresponding to the channel button operation.
20	O	Hi	POWER	Controls power ON/OFF by the power operation.
21	I	Serial pulse	IN	Receives the transmitter output. Outputs the 16-bit serial pulse in parallel.
26	I	Hi	RESET	Reset pulse input pin. By this, the μP is reset.
27	I	O	VGG	GND pin of μP.

Table A OPERATION MODE OUTPUT

Operation mode	Symbol	IC401 pins 5 4 3 2	IC406 pin 1
Reverse search	◀ SEARCH	0 0 0 1	6.4 (kΩ)
Frame-advance	FRAME ADV.	0 0 1 0	21.4
—	—	0 0 1 1	—
Record	RECORD	0 1 0 0	51.4
Rewind	REWIND	0 1 0 1	3.4
—	—	0 1 1 0	—
Pause	PAUSE	0 1 1 1	0
Play	PLAY	1 0 0 0	111.4
F. FWD	F. FWD	1 0 0 1	4.7
Slow	SLOW	1 0 1 0	15.4
—	—	1 0 1 1	—
Dubbing	A. DUB	1 1 0 0	31.4
Stop	STOP	1 1 0 1	2.3
Forward search	SEARCH ▶	1 1 1 0	8.5
—	—	1 1 1 1	—

1: Hi = 10V

0: Lo = 0V

Table B SLOW SPEED OUTPUT

Number of operation ▼ ▲	IC401 pins 8 7 6	IC407 pins 14
7	0 0 0	192 (kΩ)
6	0 0 1	130
5	0 1 0	93
4	0 1 1	66
3	1 0 0	36
2	1 0 1	24
1	1 1 0	12
Initial state	1 1 1	0

0: Lo = 0V

1: Hi = 10V

Table C SLOW TRACKING OUTPUT

Number of operation ▼ ▲	IC401 pins 16 13 12 11 10	IC407 pin 1
15	0 0 0 0 0	189 (kΩ)
14	0 0 0 0 1	183
13	0 0 0 1 0	177
12	0 0 0 1 1	171
11	0 0 1 0 0	165
10	0 0 1 0 1	159
9	0 0 1 1 0	153
8	0 0 1 1 1	147
7	0 1 0 0 0	141
6	0 1 0 0 1	135
5	0 1 0 1 0	129
4	0 1 0 1 1	123
3	0 1 1 0 0	117
2	0 1 1 0 1	111
1	0 1 1 1 0	105
Initial state	0 1 1 1 1	99
1	1 0 0 0 0	93
2	1 0 0 0 1	87
3	1 0 0 1 0	81
4	1 0 0 1 1	75
5	1 0 1 0 0	69
6	1 0 1 0 1	63
7	1 0 1 1 0	57
8	1 0 1 1 1	51
9	1 1 0 0 0	45
10	1 1 0 0 1	39
11	1 1 0 1 0	33
12	1 1 0 1 1	27
13	1 1 1 0 0	21
14	1 1 1 0 1	15
15	1 1 1 1 0	9
16	1 1 1 1 1	3

1: 10V

0: 0V

TIMER OPERATION CONTROL IC (IC1201) PIN SPECIFICATIONS

HD38800A62

Function: 3-week 8-program timer

Pin	I/O	Active Level	Abbreviation	Function
41	O	Hi	G ₈	Channel selection matrix pulse shaping and display grid drive pulses. Key circuit board selection matrix pulse shaping and display grid drive pulses. (Refer to Fig. A)
42			G ₇	
1			G ₆	
2			G ₅	
3			G ₄	
4			G ₃	
5			G ₂	
6			G ₁	
7	O	Lo → Hi	CHANNEL UP	When the 16-CH pulse (pin 30) is detected, this pin outputs the same number of pulses as the selected channel number, to select the channel.
8	O	Lo	TIMER ON	Set to Hi at the preset recording time, and Hi during recording. 1. Program execution precedence. Preset time earlier > Those with lower program No. 2. Program executed when power failure is restored. Those which have started before power failure.
9	I	Hi	REMOTE CH-UP	Receives channel selection using remote control. The channel-up output is obtained from pin 7 by this operation. Single-shot pulse (100msec.) is output from pin 7 for every operation.
10	I	Lo	P. FAIL	Detects power failure when this pin is set to Lo. Inhibits input/output of μ P during the backup period. By this, the display does not function during the backup period.
11	I	—	CLOCK	Input pin of clock pulse which is the reference of μ P.
13	O	Hi	Hz/Hr	Frequency of μ P and the time display system are changed over by applying this output to the matrix pulse. Hz selection: Connected to pin 23 60Hz Not connected 50Hz Time selection: Connected to pin 24 24Hr Connected to pin 25 12Hr
14	I	—	Vdisp	Supplies -B power to the output buffer in μ P for G ₁ - G ₈ . Luminance of the display is changed by changing this potential.
15	I	Hi	RESET	Resets μ P when the power is supplied.
18	I	—	OSC 1	External oscillator connection pin.
22	I	Hi	MATRIX 1	Combine G ₁ - G ₈ using keys and produce matrix pulses. The program is stored by these pulses. (Table A)
23			MATRIX 2	
24			MATRIX 3	
25			MATRIX 4	
26	I	Lo	TIMER	Inputs that the timer mode is entered.
27	I	Hi	POWER	Inputs that power is supplied to the RF section. (T12V) (Channel selection possible)
29	O	Hi	LED CONTROL	This is the output to make the 16-CH lamp go off when the timer switch is set to ON.

Pin	I/O	Active Level	Abbreviation	Function
30	O	Hi	16CH	Reference channel during channel selection. μ P generates the pulse corresponding to the number of the channel after receiving this channel signal. Selection of 16-CH is instructed by the timer stand-by, power OFF.
32	O	Hi	a, 3	3: 3rd week 2: 2nd week ON: Start, PF: Power failure OFF: Finish, CH: Channel selection Program number Day of week * Light synchronized with the grid drive pulses G ₁ - G ₈ .
33			b, 2	
34			c, ON, AM, PF,	
35			d, OFF, PM, CH	
36			e	
37			f	
38			g	
39			1 - 8	
40			SUN - SAT	

Table A 8 ϕ PULSES AND SEGMENT DRIVE PULSES & MATRIX PULSES

		8φ PULSES							
		41 G 8	42 G 7	1 G 6	2 G 5	3 G 4	4 G 3	5 G 2	6 G 1
(22)	MAT 1	1CH	2CH	3CH	4CH	1 SUN	2 MON	3 TUE	PROGRAM
(23)	MAT 2	5CH	6CH	7CH	8CH	4 WED	5 THU	6 FF!	CLEAR
(24)	MAT 3	9CH	10CH	11CH	12CH	7 SAT	8 DAILY	9 WEEKLY	
(25)	MAT 4					0 2WK/ 3WK	AM/PM	Hr/Min	CLOCK
(32)~(40)		23	SUN	MON	TUE	WED	THU	FRI	SAT
(SEGMENT DRIVE PULSES)	ON	AM			:	:	:	CH	
	OFF	PM			:	:	:		
		1	2	3	4	5	6	7	8

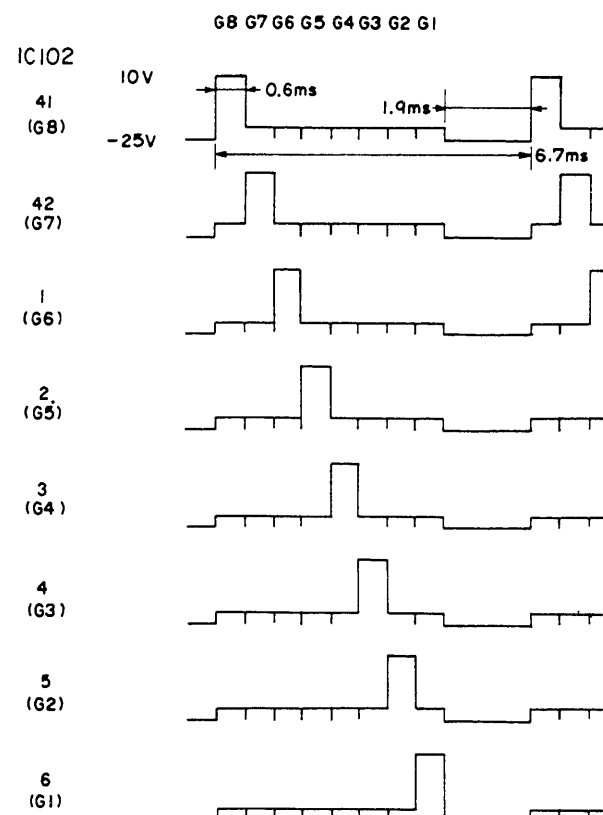


Fig. A 8 Phase pulse



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SERVICE MANUAL

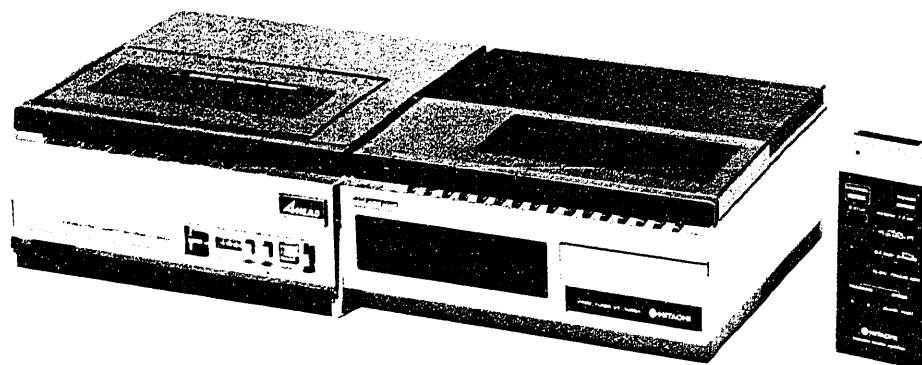
REVISED

TK

No. 1787E

VT-6800A
VT-TU68A

Technical Data



VT-6800A

VT-TU68A



**THIS VIDEO DECK IS A
VHS TYPE VIDEO RE-
RECORDER.
FOR PROPER OPERA-
TION, ONLY VHS TYPE
CASSETTES MUST BE
USED.**

This service manual is a revised edition of the previously issued manual (VT-6800A/VT-TU68A, NO. 1705E)

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

PORTABLE VIDEO DECK. VIDEO TUNER

August 1982

TOKAI WORKS

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SAFETY PRECAUTION

The following precautions should be observed when servicing.

1. Since many parts in the unit have special safety-related characteristics, always use genuine Hitachi replacement parts. Especially critical parts in the power circuit block should not be replaced with other makes. Critical parts are marked with $\triangle$ in the schematic diagram and circuit board diagram.
2. Before returning a repaired unit to the customer, the service technician must thoroughly test the unit to ascertain that it is completely safe to operate without danger of electrical shock.

FOR CANADA

CAUTION AGAINST FUSE REPLACEMENT

FOR CONTINUED PROTECTION AGAINST FIRE HAZARD, REPLACE ONLY WITH SAME TYPE AND SAME RATING FUSE IN ACCORDANCE WITH THE FUSE SYMBOL LABEL.

The following is the indication of the fuse symbol label which is affixed adjacent to the fuse in the equipment.

* Example



This symbol indicates Fast Operating Type 2A, 250V Fuse.

LIST OF DIFFERENCES

Models VT-6800A, VT-TU68A provided with the features below are based on VT-6500A, VT-TU65A.

	VT-6800A	VT-6500A
Video heads	4 heads 28μm/32μm (LP/EP) 75μm/90μm (SP)	2 heads 28μm/32μm (SP/LP/EP)
Recording tape speed	3 speed (SP/LP/EP)	3 speed (SP/LP/EP)
Playback tape speed	• SP, LP or EP speed (Automatically) • Forward or Reverse visual search (SP and EP mode). • Slow (SP and EP mode). • Frame advance (SP and EP mode). • STILL (SP and EP mode).	• SP, LP or EP speed (Automatically) • Forward or Reverse visual search (EP mode only). • Slow (EP mode only). • Frame advance (EP mode only) • STILL (EP mode only).
Slow X value adjust arm	None	Provided
Cylinder tach magnet	1	2
Remote control jack	Rear	Front
Camera select switch	Side	None
Camera pause polarity switch	Side	None
VTR power control	VTR power switch	VTR & tuner power switches

	VT-TU68A	VT-TU65A
Timer switch	Provided (button switch)	Used for both power & timer
Power switch	None	Lever switch
Remote control cable	Rear (connected to VTR)	None
Clock set button	Numeral direct input type: 12 buttons	Numeral feed type: 6 buttons
Record program	8-program/ 3-week	8-program/ 2-week
Wireless remote control	Provided (infrared remote control)	None (wired remote control)

SPECIFICATIONS

VT-6800A

Recording: Rotary 2-Head Helical Scan
Azimuth Recording
NTSC Color EIA Standard
VHS Type

Video: 33.35 mm/sec. (SP mode)
16.67 mm/sec. (LP mode)
11.12 mm/sec. (EP mode)

Cassette: VHF 75 ohm UHF 300 ohm

Tape Speed: Channel 3 or Channel 4

RF Input: 0.5 – 2 Vp-p, 75 ohm Unbalanced

RF Output: 1.0 Vp-p, 75 ohm Unbalanced

Video Input: – 20 dB, 50k ohm

Video Output: – 69 dB, 1k ohm

Audio Input: – 6 dB, 500 ohm

Mic Input: SP: Better than 46 dB
LP: Better than 43 dB
EP: Better than 40 dB

Audio Output: SP: 240 lines
LP: 230 lines
EP: 230 lines

Horizontal Resolution: SP: 50 Hz to 10 kHz
LP: 50 Hz to 7 kHz
EP: 100 Hz to 6 kHz

Audio Response: SP: Better than 43 dB
LP: Better than 40 dB
EP: Better than 40 dB

Audio S/N: DC 12V

Power Input: 5.8W Nominal (recording with
DC 12V power supply)

Power Consumption: 26.3(W) x 10.8(H) x 25.7(D) cm

Cabinet size: 5.0 kg (with Battery Pack VT-BP65A)

Weight: 1 – Coaxial cable with F-type
connectors
1 – Matching transformer 300 –
75 ohm
1 – Matching transformer 75 –
300 ohm
1 – T - 60 Cassette tape
1 – Exclusive battery pack
VT-BP65A
1 – Earphone
1 – Adjustment driver

VT-TU68A

Video signal: NTSC color signal

Antennas: VHF: 75 ohm external terminals
UHF: 300 ohm external
terminals

Power Consumption: 55W

Timer: Crystal synchronization system

Timer Power: 7.5W

Power Input: AC 120 V 60 Hz

Dimensions: 26.3(W) x 10.8(H) x 26.5(D) cm

Weight: 4.5 kg

Accessories: 1 – UHF twin lead
1 – Channel plate
1 – Infrared remote control unit
1 – Battery

Design and specification subject to change without notice.

KEY TO ILLUSTRATIONS

VT-6800A

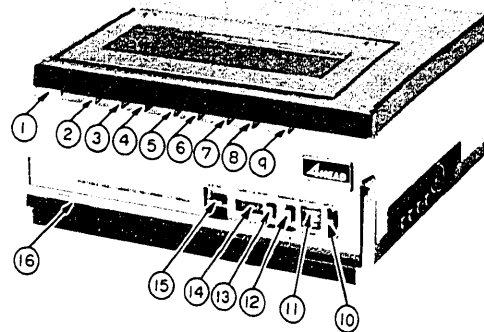


Fig. 1 Front view

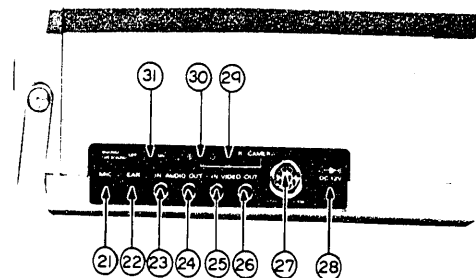


Fig. 2 Side view

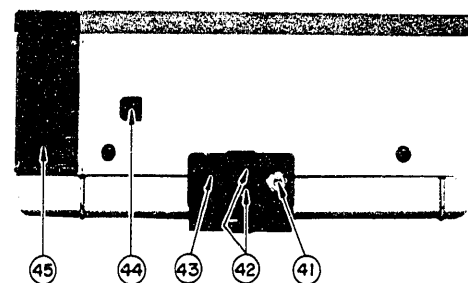


Fig. 3 Rear view

Front

1. Power switch
2. Audio Dub button
3. Record button (REC)
4. Rewind button (REW)
5. Play button (PLAY)
6. Fast Forward button (F. FWD)
7. Stop button (STOP)
8. Pause button (PAUSE)
9. Video Dub button
10. Standard-Double-Triple speed select switch (SP-LP-EP switch)
11. Battery meter
12. Memory counter switch
13. Counter reset button
14. Tape counter
15. Eject lever
16. Tracking control knob

Side

21. Microphone jack
22. Earphone jack
23. Audio input jack
24. Audio output jack
25. Video input jack
26. Video output jack
27. Camera jack
28. External battery jack
29. Camera select switch
30. Camera pause polarity switch
31. Sound on sound switch

Rear

41. RF output jack
42. Remote control jack
43. Tuner/adaptor jack
44. RF converter channel select switch (CH-3 - CH-4)
45. Internal battery jack

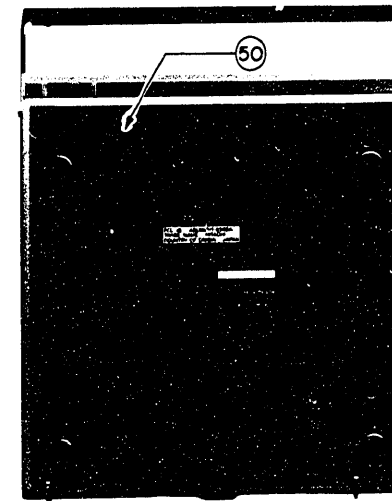


Fig. 4 Bottom view

Bottom

50. Vertical drive pulse adjustment hole

Picture rattling adjustment during trick play and search mode

With the small lid in the bottom cover removed, the adjustment hole is seen. Picture rattling during trick play and the search mode can be controlled by adjusting through this hole using a mini-screwdriver according to the adjustment procedure (Vertical drive pulse adjustment procedure). Adjust the SP side when rattling occurs in the SP mode, and adjust the EP side when it occurs in the EP mode.

VT-TU68A

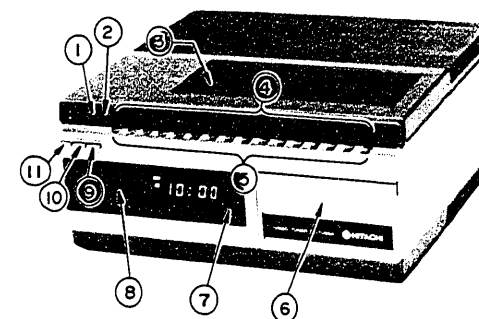


Fig. 5 Front view

Front

1. Timer indicator
2. Charge indicator
3. Channel preset
4. Channel indicator
5. Channel select button
6. Timer program
7. Timer display
8. Infrared rays receiver
9. Charge switch
10. Timer switch
11. TV/VTR output selector switch (TV/VTR switch)

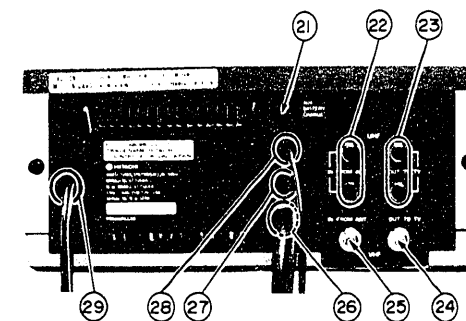
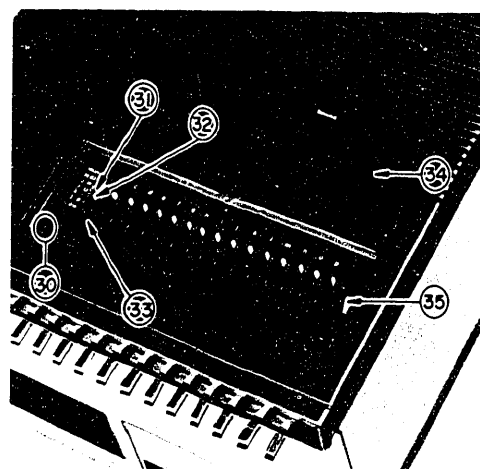


Fig. 6 Rear view

Rear

21. Aux. battery charge jack
22. UHF antenna input terminal
23. UHF antenna output terminal
24. VHF antenna input terminal
25. VHF antenna output terminal
26. VTR connection cord (10P DIN cord)
27. RF cord
28. Remote cord
29. Power cord



Channel preset section

30. Timer reset switch

In the event of a malfunction of microprocessor IC101, the digital display may be reset by pushing the timer reset button.

31. Channel index

32. Band selector switch

33. Fine tuning knob

34. AFS tab

In case of extreme interference or a very weak signal, turn off AFS by placing the AFS tab in the "OFF" position. Then fine tune for the best picture. Do not turn on AFS after fine tuning.

35. AFS switch

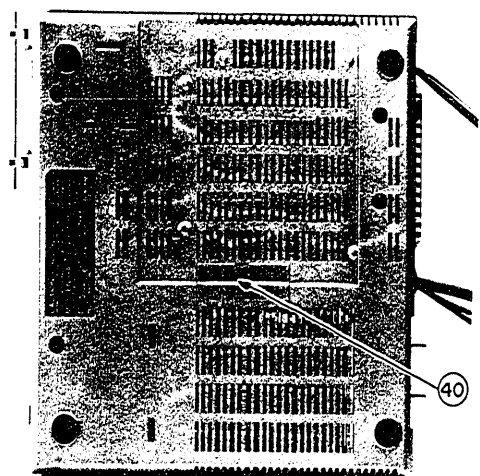


Fig. 8 Bottom view

Remote control unit

Remote control unit

1. Infrared rays emission window

2. Power switch ON/OFF button

3. Mode control button

4. Slow speed buttons (Right button: faster)

(Left button: Slower)

5. Slow tracking buttons (Left button: Noise bar up)

(Right button: Noise bar down)

6. Channel-UP button

7. Remote transmission indicator lamp

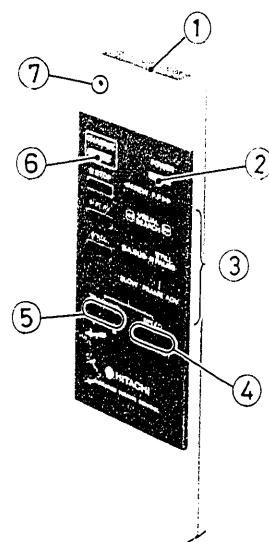
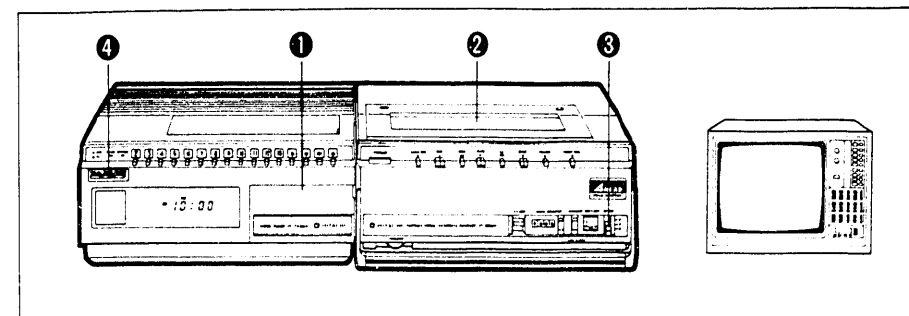


Fig. 9 Front view

TIMER RECORDING (UNATTENDED RECORDING)

Once you have set the Timer built-in Video Tuner for unattended recording, you can forget about it. The Timer will turn your Video Tuner and Portable VTR on and off at the time you set.



1. Set the program timer.

"CORRECT TIME", "START TIME", "STOP TIME" etc. Refer to the "SETTING THE PROGRAM TIMER" on page 10.

2. Insert the Cassette.

Be sure to check that the record safety tab is not missing. If the record safety tab is missing, recording will not begin.

3. Set speed selector to "EP", "LP" or "SP".

4. Set Timer Switch to ON. Now recording will begin at start time.

Note: • It is not necessary to press PLAY and RECORD buttons.

• TV does not have to be on for Timer Recording.

• When Timer Switch is on, your VTR cannot be operated manually.

To monitor program to be recorded

1. Turn on TV and set the channel of your TV to CH3 or CH4 (for your video channel).

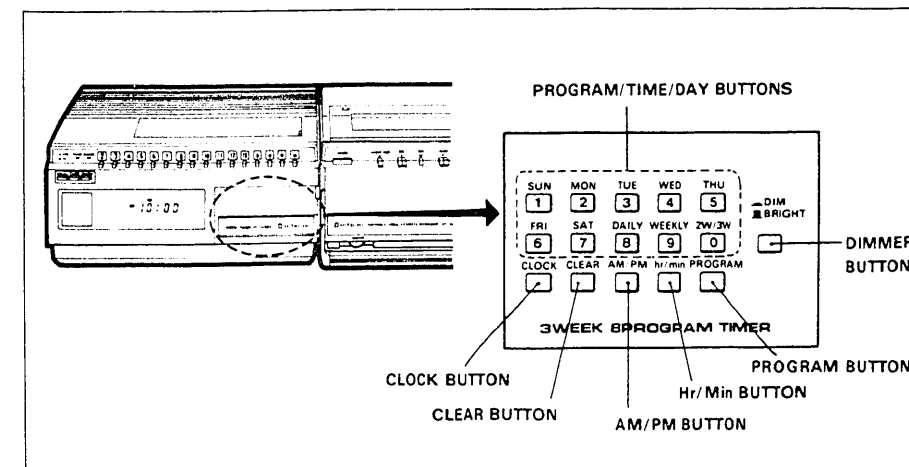
2. Turn off Timer Switch of Video Tuner and Turn on Power Switch of the VTR.

3. Set the output selector to "VTR".

4. Follow the steps described in item (1) of the section READING THE PROGRAM TIMER on page 12.

5. After checking the program, turn off TV and set the Timer Switch of the Video Tuner to ON.

PROGRAM TIMER



SETTING THE PROGRAM TIMER

When the AC cord is first connected to AC wall socket the Timer display flashes AM 12:00.
The brightness of the Timer display can be selected with the Dimmer button.



To pre-set the program timer, input the setting information according to the flashing indication on the Timer display.

Example: When "ON" is flashing, program the start time.
When "OFF" is flashing, program the stop time.

Note: The indications 2w, 3w do not flash.

SETTING THE TIMER CLOCK TO THE CORRECT TIME

(In the example below, the clock is being set to 10:30 AM, Tuesday).

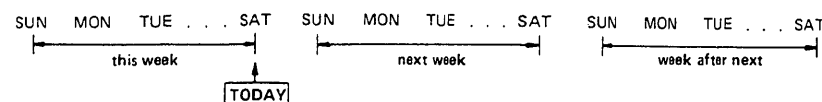
- (1) Press and hold **CLOCK** button while performing steps (2) through (4) below.
- (2) Press **TUE** button.
(This sets the clock to "Tuesday").
- (3) Press **AM/PM** button. (This sets to the clock to "AM".)
- (4) Press the buttons in the following sequence. (10 hours, 30 minutes)
- (5) Release **CLOCK** button.
Now the clock will operate.

TO RECORD ON ONE DAY ONLY FOR ONE TIME FRAME

(In the example below, Program "1" is being set to record Channel 2 on Friday from 9:15 PM to 11:00 PM)

- (1) Select the Program in which the timing information is to be stored.
Press **PROGRAM**, then press **1**.
- (2) Select the day the VCR is to start.
Press **FRI** button.
- (3) Press **AM/PM** button twice. (This sets to the clock to "PM".)
- (4) Select the time the VCR is to start.
Press the buttons in the following sequence.
9 **Hr/Min** **1** **5** **Hr/Min**
- (5) Press **AM/PM** button twice. (This sets to the clock to "PM".)
- (6) Select the time the VCR is to stop.
Press the buttons in the following sequence.
1 **1** **Hr/Min** **0** **0** **Hr/Min**
- (7) Select the channel to be recorded.
Press the channel selector button on the front panel.
Now the start time appears on the timer display and after several seconds, the display indication changes to the stop time. After about 8 seconds, display changes automatically to present time.

Note: A timer built in this Video Tuner can preset the programs within three weeks. A week in this timer means from SUNDAY to SATURDAY.



Today is SATURDAY and if you want to record the program on SUNDAY (tomorrow), the week indicator should be set to "2W". If the week indicator is not set to "2W" and only the day of the week is set to "SUN", recording will not start because SUNDAY is past time.

TO RECORD ON A SPECIFIED DAY AT THE SAME TIME WEEK

(In the example below, Program "2" is being set to record Channel 3 every Saturday from 11:30 AM to 12:05 PM)

- (1) Select the Program in which the timing information is to be stored.
Press **PROGRAM**, then press **2**.
- (2) Select the day the VTR is to start.
Press **WEEKLY**, then press **SAT** button.
- (3) Press **AM/PM** button. (This sets to the clock to "AM".)
- (4) Select the time the VTR is to start.
Press the buttons in the following sequence.
1 **1** **Hr/Min** **3** **0** **Hr/Min**
- (5) Press **AM/PM** button twice. (This sets to the clock to "PM".)
- (6) Select the time the VTR is to stop.
Press the buttons in the following sequence.
1 **2** **Hr/Min** **0** **5** **Hr/Min**
- (7) Select the channel to be recorded. Press the channel selector button on the front panel.
Now the start time appears on the timer display and after several seconds, the display indication changes to the stop time. After about 8 seconds, display changes automatically to present time.

TO RECORD AT THE SAME TIME EVERY DAY OF THE WEEK

(In the example below, Program "3" is being set to record Channel 3 every day from 7:00 PM to 7:30 PM.)

- (1) Select the Program in which the timing information is to be stored.
Press **PROGRAM**, then press **3**.
- (2) Select the day the VTR is to start.
Press **DAILY** button.
- (3) Press **AM/PM** button twice. (This sets to the clock to "PM".)
- (4) Select the time the VTR is to start.
Press the buttons in the following sequence.
7 **Hr/Min** **0** **0** **Hr/Min**
- (5) Press **AM/PM** button twice. (This sets to the clock to "PM".)
- (6) Select the time the VTR is to stop.
Press buttons in the following sequence.
7 **Hr/Min** **3** **0** **Hr/Min**
- (7) Select the channel to be recorded. Press the channel selector button on the front panel.
Now the start time appears on the timer display and after several seconds, the display indication changes to the stop time. After about 8 seconds, display changes automatically to present time.

TO RECORD ON ANY DAY THE NEXT WEEK OR THE WEEK AFTER NEXT

(In the example below, Program "1" is being set to record Channel 6 on Wednesday the week after next from 9:15 PM to 11:00 PM.)

- (1) Select the program in which the timing information is to be stored.
Press **PROGRAM**, then press **1**.
- (2) Select the day the VTR is to start.
Press **2W/3W** twice, then press **WED**.
If you want to store timing information in the Program "1" on Wednesday the next week, proceed as follows.
Press **2W/3W**, then press **WED**.
- (3) Operate in the same way as in "TO RECORD ON ONE DAY ONLY FOR ONE TIME FRAME", item (3) - (7), thereafter.

READING THE PROGRAM TIMER

(In the example below, inputs have been made to Program "2" so that it will record Channel 3 on the following Saturday, from 11:30 AM to 12:05 PM.)

- (1) Press **PROGRAM**, then press **2**.

Indicator lights show the channel selected and the day and time the VTR will start.
After several seconds, display indication changes to the stop time.

- (2) After about 8 seconds, display changes automatically to present time.

Note: The picture of the programmed channel is seen on the TV screen.

CLEARING ("ERASING") INFORMATION FROM A PROGRAM

1. TO CLEAR ALL INFORMATION FROM A PROGRAM

(In the example below, all previous inputs are being cleared from Program "2". It had been previously programmed to record Channel 3 on the following Saturday from 11:30 AM to 12:05 PM.)

- (1) Press **PROGRAM**, then press **2**.

The start time will appear on the timer display.

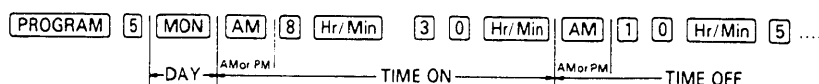
After several seconds display indication changes to the stop time.

- (2) Press **CLEAR** button before display returns to present time.

2. TO CLEAR AN ERROR WHILE PROGRAMMING

- Program timing data can be considered to be grouped into block: "Day", "Time ON", "Time off", & "TV channel". If an error is made while programming a block, press **CLEAR** and begin the block over again.

For example, you are setting Program "5" to start recording at 8:30 AM on Monday, and stop recording at 10:00 AM.



At this point you realize you pressed **5** instead of **0**. You do not have to start at the beginning to correct. Press **CLEAR** and start the "TIME OFF" block again.

- If you want to make a change in Program during a time previously stored in the Program Timer, proceed as follows:

- a. Press **PROGRAM**, then press **1** through **8** which should be changed.
- b. Press **CLEAR** button.

This will clear all previously entered information from the affected program and allow you to enter new information.

For example: Suppose Program "1" was previously set to record Channel 2 between 8:30 PM and 10:00 PM on Monday. At 9:10 PM on Monday you decide to change the information stored in Program "1". To do so, proceed as follows:

Press **PROGRAM**, then press **1**.

Press **CLEAR**.

Now all previously stored information in Program "1" has been cleared and new information can be entered.

ADDITIONAL TIMER PROGRAMMING INFORMATION

1. Hours and minutes can be set in single or double digits.
For example, the following procedures are both acceptable to input.

OR

PM 0 7 Hr/Min 0 0 Hr/Min

PM 7 Hr/Min 0 Hr/Min

2. Before setting the program timer, set the clock to the correct present time.

3. If the "TIME ON" is before midnight and the "TIME OFF" is the following day, only the "DAY" for "TIME ON" needs to be entered.

4. When the Start time of two or more programs overlap, the Program that starts first will continue to the programmed "TIME OFF" before the timer changes to the next Program.

For example, Program "3" starts at 9:00 AM and stops at 10:00 AM. If Program "1" is set to start at 9:30 AM, it will not start until 10:00 AM when Program "3" stops.

When the Start times of two or more Programs are the same, the Timer will select the programs in the following priority sequence: 1, 2, 3, 4, ..., 8.

5. If you want to stop recording during "Timer Recording", set the Timer Switch to "OFF", then press stop button.

6. The repeating program such as weekly or daily, etc. is kept memorized after 3 weeks unless the program is otherwise cleared.

CAUTION: Open the Fine Tuning Access Door and insert the pin etc. into the hole at the left corner toward you and push when the indication or operation of the display becomes abnormal for some reason. The display indication will be cleared and reset the timer.

POWER FAILURE COMPENSATION CIRCUIT

The power failure compensation circuit operates when AC cord is connected to AC wall socket. When power failure occurs, the built-in power failure compensation circuit works; the timer display goes off but the clock operation and the previously set program continue operation normally.

When the power is restored, the timer display operates normally again. This compensation circuit operates when the power failure continues for less than approx. 1 hour. When the power failure continues more than that, the Timer display indicator flashes and all previously stored information will be cleared.

Set the present time and the programming again at that time.

Note: The power failure compensation circuit is operated by the built-in rechargeable battery.

The built-in batteries have not been charged when the AC cord is first inserted into the AC socket, so the power failure compensation circuit does not operate. This circuit operates approx. 30 hrs after power is supplied.

Battery is completely discharged when the power compensation is done for 1 hour, so the power compensation circuit does not work again within 30 hrs after power is supplied.

DISMANTLING

VT-6800A

1. Main mechanical parts locations

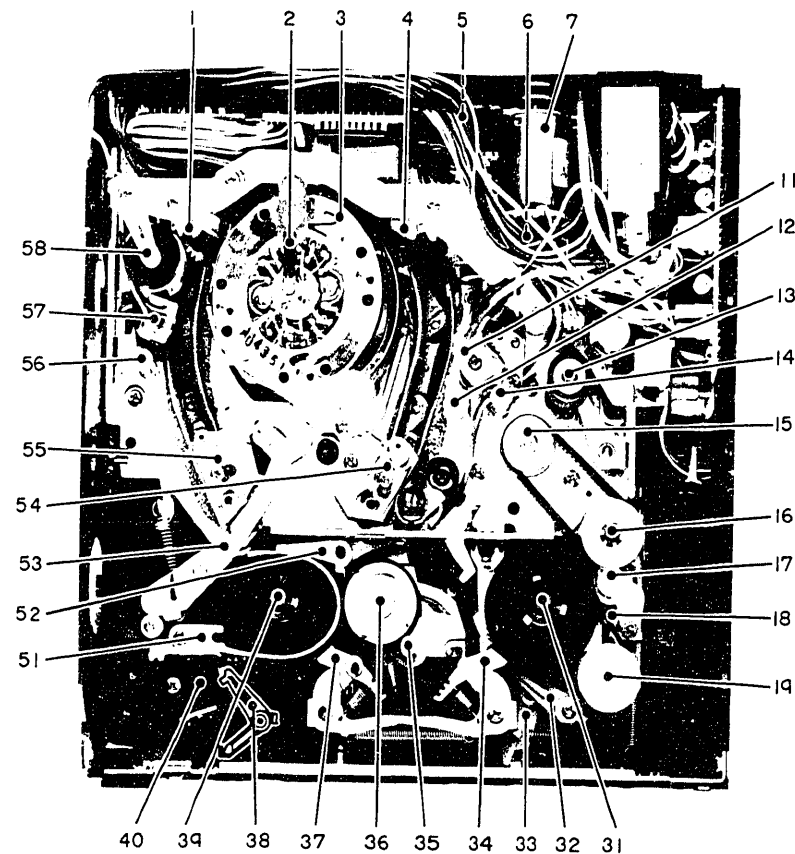


Fig. 1 Top view

- | | |
|--|----------------------------------|
| 1. CATCHER (SUPPLY) | 11. AC HEAD (AUDIO/CONTROL HEAD) |
| 2. CYLINDER MOTOR GND PIECE | 12. X VALUE ADJUSTMENT SCREW |
| 3. CYLINDER WITH FOUR VIDEO HEADS (VIDEO HEAD) | 13. PRESSURE ROLLER |
| 4. CATCHER (TAKE - UP) | 14. GUIDE POLE (TAKE - UP) |
| 5. BRAKE PULLEY | 15. CAPSTAN |
| 6. BRAKE OPERATION MECHANISM | 16. TAKE - UP PULLEY |
| 7. LOADING MOTOR | 17. PLAY IDLER |
| | 18. TAKE - UP BRAKE |
| | 19. COUNTER PULLEY |

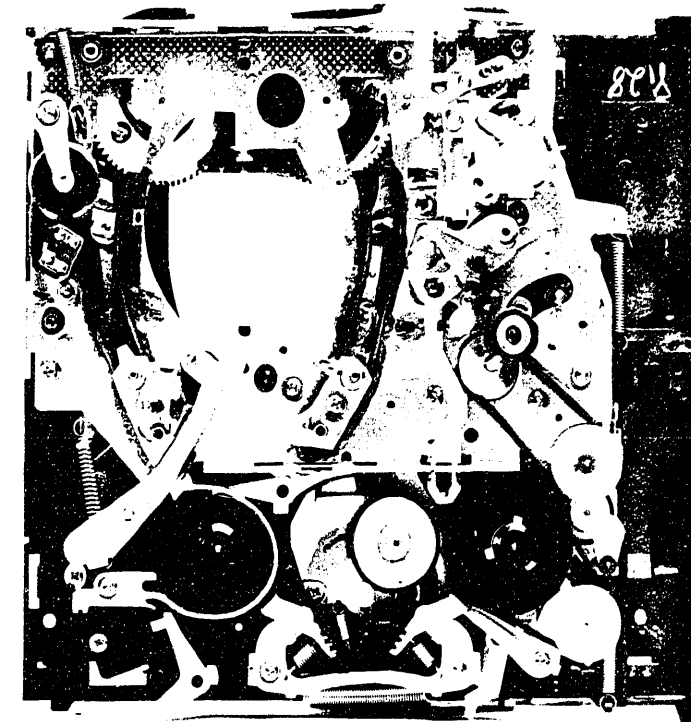


Fig. 2 Top view of brake operation mechanism

- | | |
|--------------------------------|-----------------------------------|
| 31. REEL DISK (TAKE - UP) | 51. TENSION BAND |
| 32. FF/REW IDLER RELEASE LEVER | 52. SUPPLY BRAKE |
| 33. EJECT PREVENTION TAB | 53. TENSION ARM |
| 34. MAIN BRAKE (TAKE - UP) | 54. GUIDE ROLLER BASE (TAKE - UP) |
| 35. REEL MOTOR PULLEY | 55. GUIDE ROLLER BASE (SUPPLY) |
| 36. FF/REW IDLER | 56. GUIDE POLE (SUPPLY) |
| 37. MAIN BRAKE (SUPPLY) | 57. FE HEAD (FULL ERASE HEAD) |
| 38. SAFETY TAB LEVER | 58. IMPEDANCE ROLLER (SUPPLY) |
| 39. REEL DISK (SUPPLY) | |
| 40. SAFETY TAB SWITCH | |

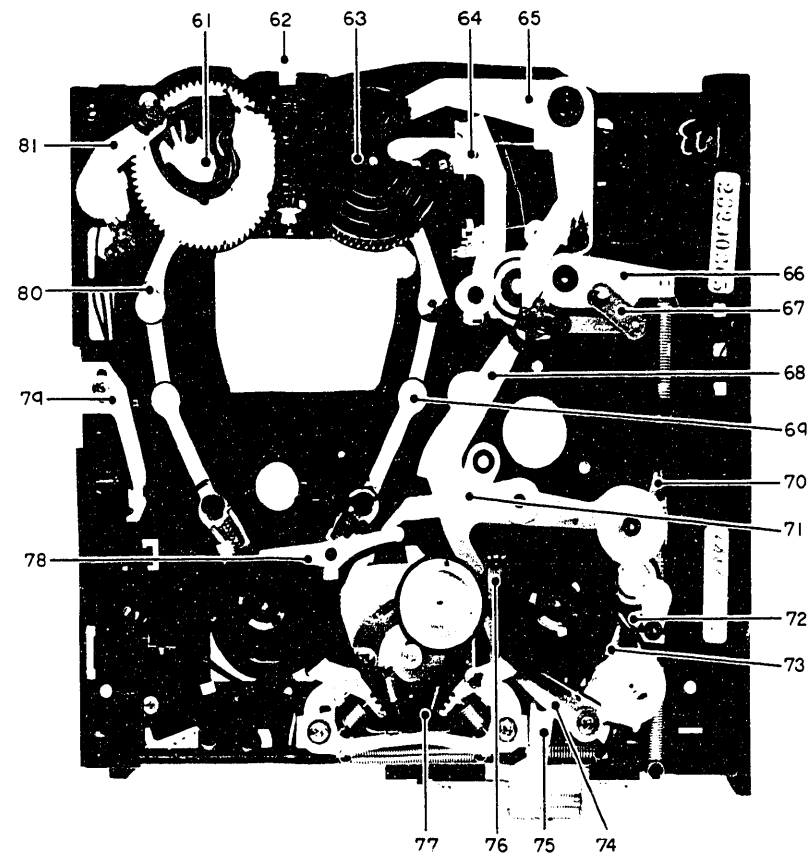


Fig. 3 Slider/lever parts location

- | | |
|---|--------------------------------------|
| 61. LOADING GEAR (SUPPLY) | 71. SUPPLY BRAKE OPERATION ARM |
| 62. WORM GEAR PULLEY | 72. TAKE - UP BRAKE |
| 63. LOADING GEAR (TAKE - UP) | 73. OPERATION SLIDER A |
| 64. SWITCH (STATE SENSOR) OPERATION ARM | 74. FF/REW IDLER RELEASE LEVER |
| 65. DRIVE ARM A. | 75. EJECT PREVENTIVE TAB |
| 66. PRESSURE ROLLER COMPRESSION ARM | 76. MAIN BRAKE OPERATION SLIDER |
| 67. PRESSURE ROLLER DRIVE LINK | 77. MAIN BRAKE OPERATION ARM |
| 68. DRIVE ARM B. | 78. SUPPLY BRAKE |
| 69. THREE - CONNECTION LINK (TAKE - UP) | 79. TENSION SPRING HOLDER |
| 70. OPERATION SLIDER B. | 80. THREE - CONNECTION LINK (SUPPLY) |
| | 81. IMPEDANCE ROLLER DRIVE ARM |

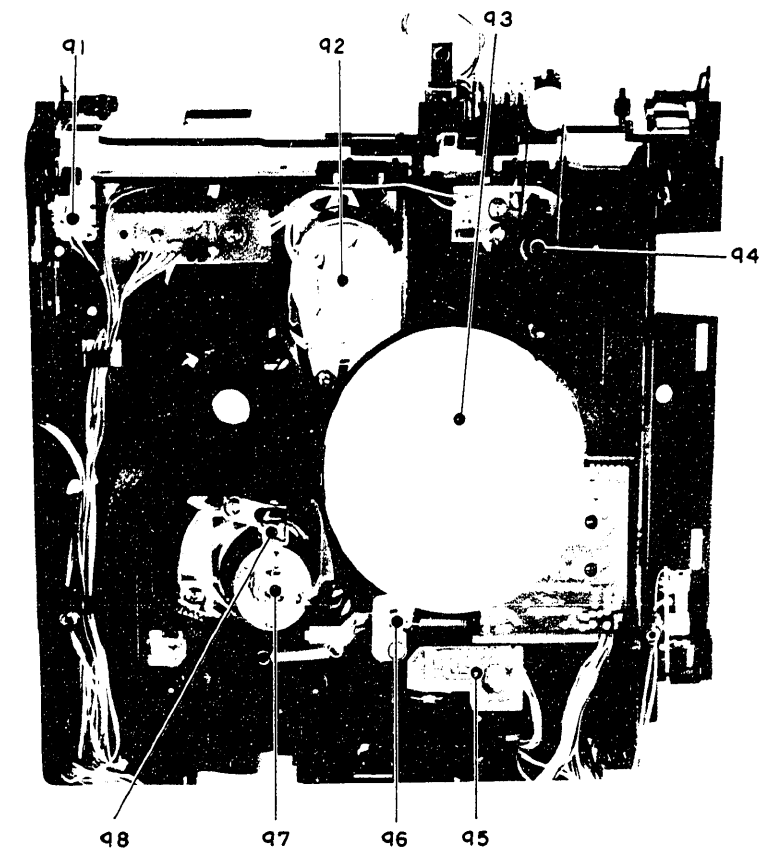


Fig. 4 Bottom view

- | |
|------------------------------------|
| 91. CASSETTE HOLDER SWITCH |
| 92. REEL MOTOR |
| 93. CAPSTAN MOTOR |
| 94. REEL SENSOR MAGNET |
| 95. MECHANICAL STATE SENSOR SWITCH |
| 96. SLOW BRAKE |
| 97. CYLINDER MOTOR |
| 98. CYLINDER TACH HEAD |

2. PC Board locations

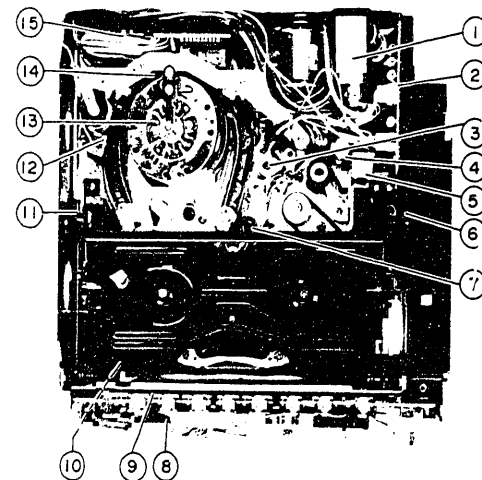


Fig. 5 Top view

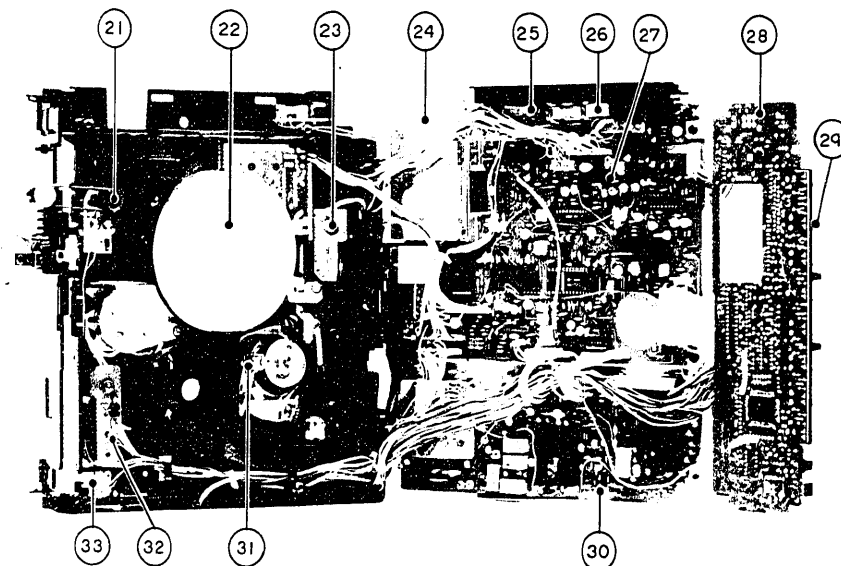


Fig. 6 Bottom view

21. Reel sensor
22. Capstan motor
23. Mechanical state sensor switch
24. Switching regulator
25. Sound-on-sound
26. Camera connector
27. Servo

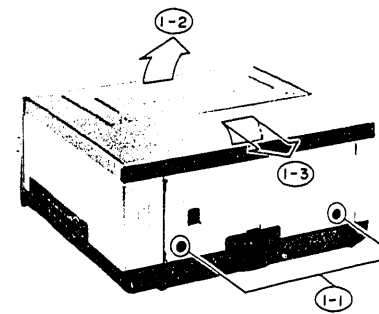
1. RF converter
2. Audio
3. AC head
4. Loading motor driver
5. Dew sensor
6. End sensor (Take-up)
7. End lamp
8. System control
9. Operation switch
10. Safety tab switch
11. End sensor (Supply)
12. Full-erase head
13. Cylinder (Video head)
14. Cylinder motor and head switch
15. Cylinder motor driver

28. System control
29. Operation switch
30. Luminance/Chroma
31. Cylinder tach head
32. Reel motor driver
33. Cassette holder switch

3. Removing the case

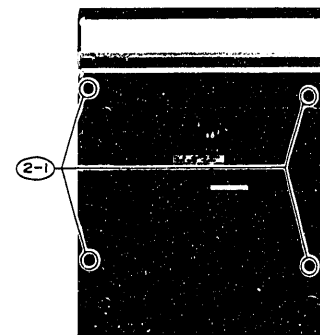
1. Top cover (Fig. 7)

- 1) Remove 2 screws.
- 2) Lift up the cassette holder.
- 3) Lift up the rear section a little and pull it backward.



2. Bottom cover (Fig. 8)

- 1) Remove 4 screws.



3. Front cover (Fig. 9)

- 1) Remove 2 screws.
- 2) Remove 2 screws.
- 3) Hold 2 hinges and lift the cover up.

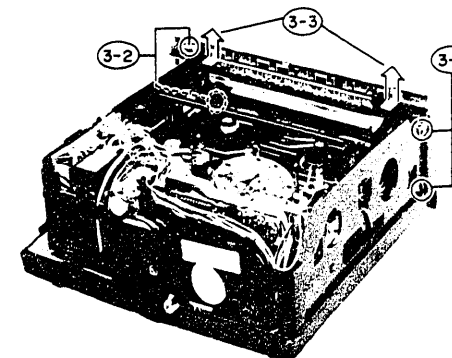


Fig. 9

4. Removing the main mechanical parts

1. Reinforcement plate
2. Cassette holder

Motors, etc.

3. Cylinder/cylinder base
4. Loading motor
5. Capstan motor
6. Reel motor

Pulleys, etc.

7. FF/REW idler
8. Impedance roller
9. Pressure roller
10. Take-up pulley
11. Play idler
12. Counter pulley
13. Reel disk
14. Slow brake

Others

15. Main brake
16. Tension arm/tension band
17. Guide roller base/Inclined guide
18. Sub. chassis
19. Loading gear
20. Frame

1. Reinforcement plate (Fig. 10)

- 1) Remove 4 screws

2. Cassette holder (Fig. 10)

- 1) Lift up the cassette holder.
- 2) Remove the safety tab switch lever.
- 3) Remove 2 screws.

Pay attention to the following when assembling the cassette holder. If it is not done correctly, the cassette holder will not operate properly after assembly. Set the cassette holder up when assembling.

1. The cassette eject arm should be on the right of the eject prevention tab when unloading is complete.
2. The synchronization plate of the cassette holder should enter between the cassette eject arm and the frame.

When the eject arm at the front of the frame is pulled toward you with the servo PC Board kept open when mounting the holder, the synchronization plate easily enters between the eject arm and the frame.

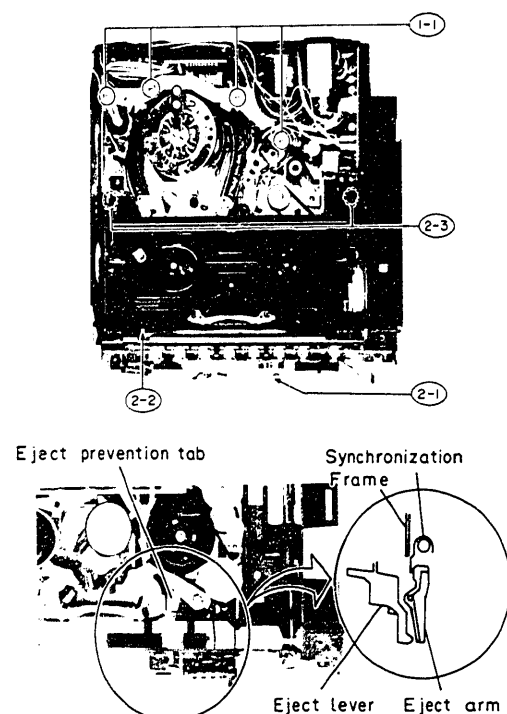


Fig. 10

3. Cylinder/cylinder motor (Fig. 11)

- 1) Remove the cord clammer from the frame, and then remove the connector between the video head and Luminance/Chroma PC Board.
- 2) Pull out the cylinder motor driver PC Board.
- 3) Remove 3 screws to remove the cylinder motor together with the base.
- 4) Remove 3 screws to separate the base and the cylinder motor from each other.

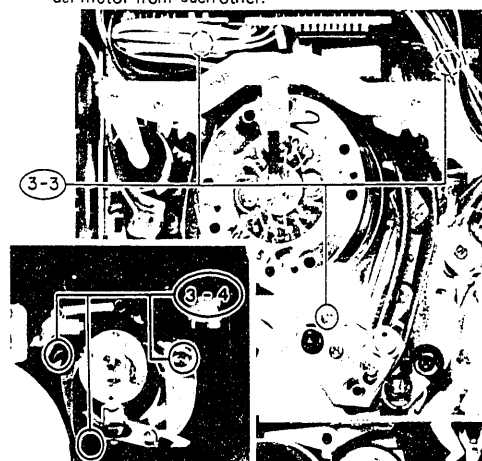


Fig. 11

4. Loading motor (Fig. 12)

- 1) Remove the connector between the loading motor and the loading motor driver PC Board.
- 2) Remove one screw.

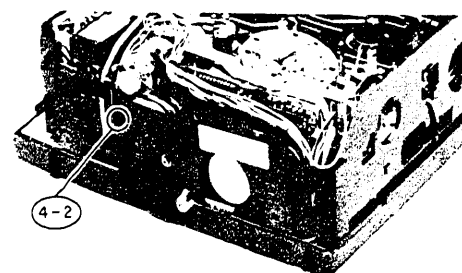


Fig. 12

5. Capstan motor (Fig. 13)

- 1) Open the servo PC Board.
- 2) Remove the connector between the capstan motor and the servo PC Board.
- 3) Remove the belt.
- 4) Remove 3 screws.

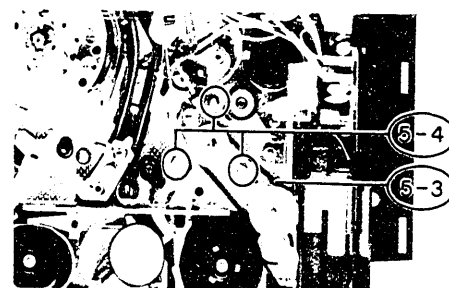


Fig. 13

6. Reel motor (Fig. 14)

- 1) Remove the connector.
- 2) Remove one screw.
- 3) Move the FF/REW idler so that it does not touch the chassis and the supply brake, and pull out the brake.

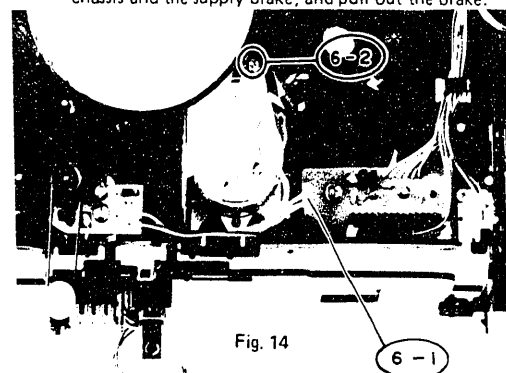


Fig. 14

7. FF/REW idler

- 1) Remove the reel motor.
- 2) Loosen the hexagonal screw which holds the motor shaft.

8. Impedance roller

- 1) Remove the reinforcement plate, and pull the roller out from the shaft.
Make sure that the roller shaft enters the U-groove in the impedance roller operation arm during assembly.

9. Pressure roller

- 1) Remove one screw inside the pressure roller.
Assemble the pressure roller with the section provided with the plastic inner wheel top.

10. Take-up pulley

- 1) Remove the washer from the take-up pulley shaft.
- 2) Remove the capstan belt and pull the pulley out of the chassis.

11. Play idler

- 1) Remove the take-up pulley.
- 2) Remove the washer from the play idler ass'y shaft.
- 3) Remove the spring between the play idler ass'y and the sub. chassis.

Check that the take-up brake shaft enters the groove just before the operation slider B, and that the play idler shaft enters the front groove during assembly.

12. Counter pulley

- 1) Remove the washer attached to the reel sensor magnet shaft at the bottom of the chassis.
- 2) Pull out the pulley upward.

13. Reel disks

- 1) Remove the washer from the reel disk shaft.
In the case of the take-up reel disk
- 2) Remove the counter pulley belt and remove the disk from the shaft.
- In the case of the supply reel
- 3) Remove the tension band.
- 4) Pull out the supply brake.
- 5) Pull out the reel disk.

14. Slow brake

- 1) Remove the capstan motor.
- 2) Loosen the screw which fixes the slow brake operation slider clamp plate.

15. Main brake

- 1) Remove the brake clamp screw.

16. Tension arm/tension band (Fig. 15)

- 1) Remove the spring between the sub. chassis and the tension arm.
- 2) Remove the tension arm clamp screw.
- 3) Remove the band holder fixing screw.

17. Guide roller base/inclined guide

Guide roller base

- 1) Remove the sub. chassis.
- 2) Remove the leaf spring clamp screw.

Inclined guide

- 1) Remove the screw at the top of the guide roller base.
- 2) Pull out the inclined guide together with the base taking care to prevent it from touching the guide roller.

18. Sub. chassis (Fig. 15)

- 1) Remove the cassette holder.
- 2) Remove the loading motor.
- 3) Remove the cylinder base (to protect the video head)
- 4) Remove the capstan motor.
- 5) Remove the tension arm.
- 6) Remove 2 springs.
- 7) Remove 5 screws.

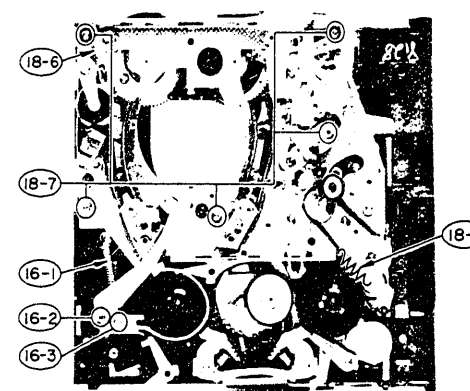


Fig. 15

6 positions shown in Fig. 16 engage with the parts attached to the sub-chassis; install the sub-chassis while checking this.

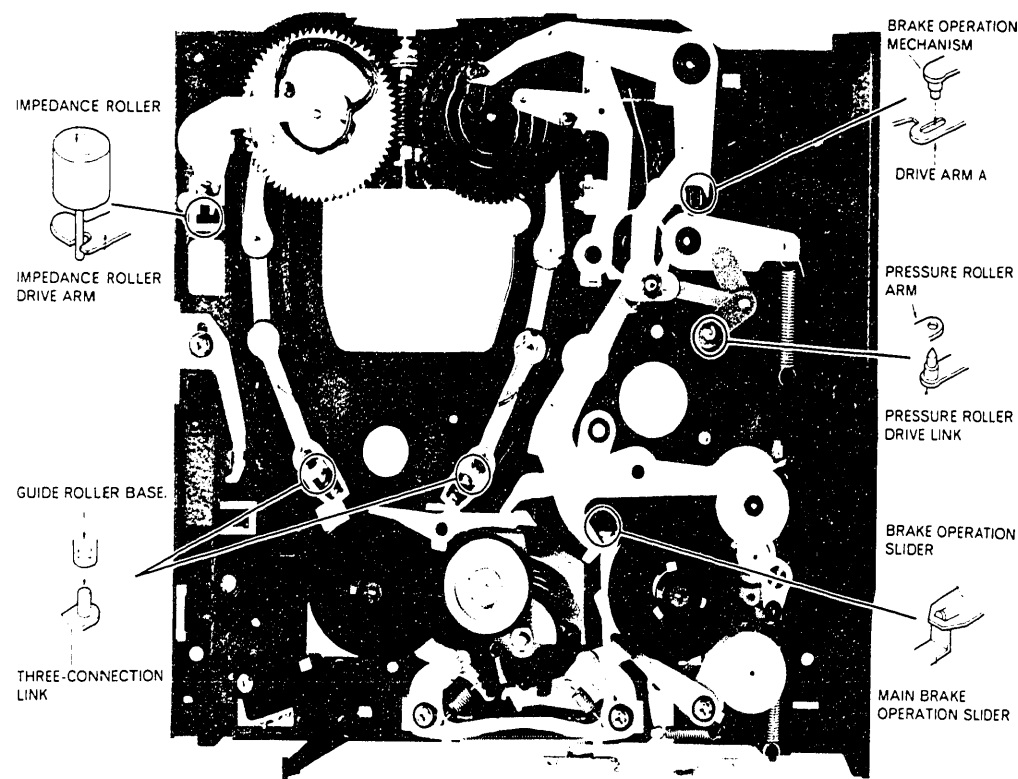


Fig. 16

19. Loading gear (Fig. 17)

- 1) Set the mechanism to the unloading complete condition.
- 2) Remove the sub. chassis.
- 3) Remove the drive arm A, switch operation arm and impedance roller operation arm.

During assembly:

1. Install the loading gear so that the triangular projections of both loading gears are symmetrical with respect to the worm gear shaft, and then turn the worm gear in the unloading direction to set the mechanism to the unloading complete condition.
2. Set all the arms to the specified positions.

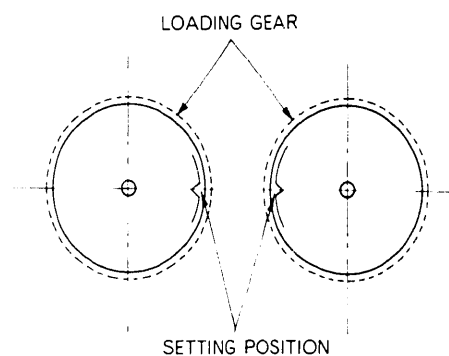


Fig. 17

20. Frame (Fig. 18)

- 1) Open the system control PC Board and Servo PC Board.
- 2) Remove the take-up end sensor from the frame.
- 3) Remove the audio PC Board.
- 4) Remove the cord clasper.
- 5) Cut 2 belts.
- 6) Remove 4 connectors of the Servo PC Board.
- 7) Remove the internal battery jack, reel sensor, relay belt, cassette holder switch, reel motor driver PC Board and supply end sensor.
- 8) Remove 3 frame fixing screws to pull the frame down.

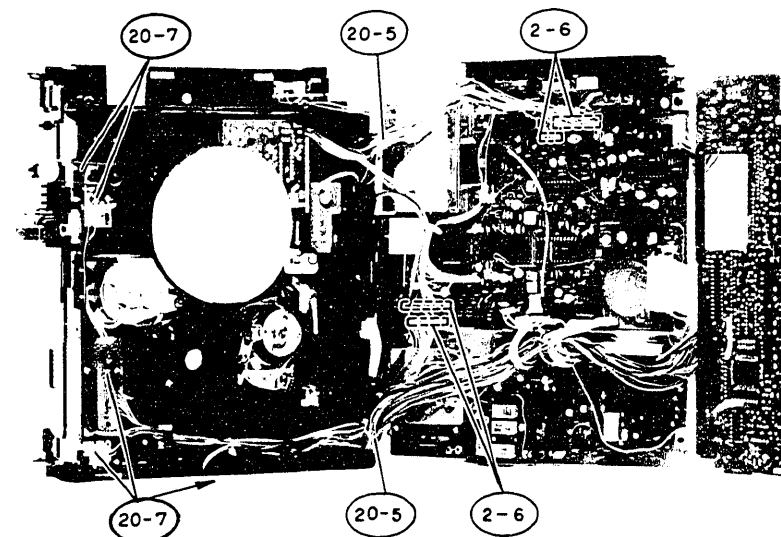
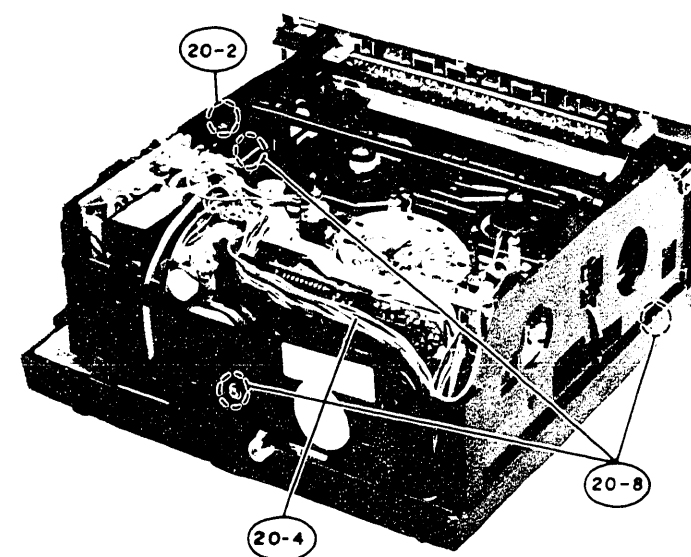


Fig. 18

5. Removing the main electric parts and PC Boards

Head

1. Upper cylinder (video head)
2. FE head
3. AC head
4. Tach head

PC Board

5. System control PC Board/operation switch PC Board
6. Servo PC Board/luminance/chroma PC Boards
7. Cylinder motor driver PC Board
8. Loading motor driver PC Board
9. Reel motor driver PC Board
10. Mechanical state sensor switch PC Board
11. Reel sensor PC Board
12. Sound-on-sound PC Board
13. Audio PC Board
14. RF converter
15. Switching regulator
16. Head switch PC Board

1. Upper cylinder (video head) (Fig. 19)

- 1) Remove the cylinder motor GND piece.
- 2) Remove 8 leads over the cylinder.
- 3) Remove 2 screws.

Caution during upper cylinder assembly

Observe the orange wires, and set so that when the 2 screw holes coincide, the orange wire of the upper cylinder and the orange wire of the rotary transformer (around the motor shaft) are positioned on both sides with 2 screw holes as the junction (they should be drawn near each other).

Fix the upper cylinder using the screws.

2 wires (white and other color) come out from the rotary transformer; solder them while checking that they are connected to the wires from the video heads on the pattern of the upper cylinder board.

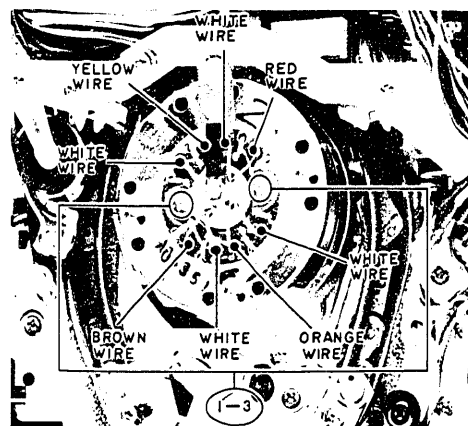


Fig. 19

2. FE head (Fig. 22)

- 1) Remove the reinforcement plate.
- 2) Remove 2 leads of the head.
- 3) Pull out the head together with the base from the chassis and remove 2 fixing screws at the bottom.

3. AC head (Fig. 22)

- 1) Remove the reinforcement plate.
- 2) Remove the nut.
- 3) Pull out the AC head together with the base paying attention to the spring.

4. Tach head (Fig. 21)

- 1) Open the servo PC Board.
- 2) Remove the tach head bracket fixing screw.
- 3) Remove 2 leads from the head.

5. System control PC Board/operation switch PC Board (Fig. 20)

- 1) Press 2 stoppers in the directions of the arrows to open the PC Board.

6. Servo PC Board/Luminance/Chroma PC Board (Fig. 20)

- 1) Open the system control PC Board.
- 2) Press 2 stoppers in the directions of the arrows to open the PC Board.

7. Cylinder motor driver PC Board

- 1) Pull out upward.

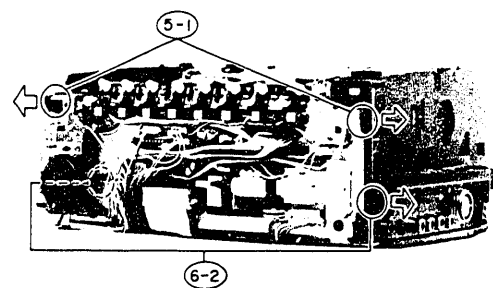


Fig. 20

8. Loading motor driver PC Board (Fig. 22)

- 1) Remove 1 screw.

9. Reel motor driver

10. Mechanical state sensor switch PC Board

11. Reel sensor PC Board

3 PC Boards mentioned above are fixed with 1 screw. (Fig. 21)

12. Sound-on-sound PC Board (Fig. 21)

- 1) Depress 2 tabs and pull out the PC Board in the horizontal direction.

13. Audio PC Board

- 1) Pull out upward.

14. RF converter (Fig. 22)

- 1) Remove 1 screw.

15. Switching regulator (Fig. 21)

- 1) Open the servo PC Board.
- 2) Unsolder 3 positions soldered to the PC Board.

16. Head switch PC Board (Fig. 22)

- 1) Remove 1 screw.
- 2) Unsolder the 8 leads from the rotary transformer while taking care not to cut them.

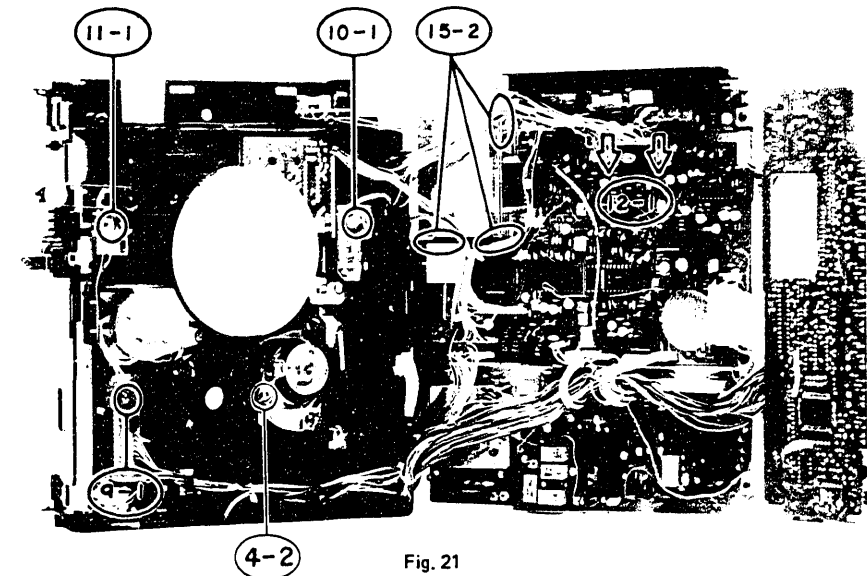


Fig. 21

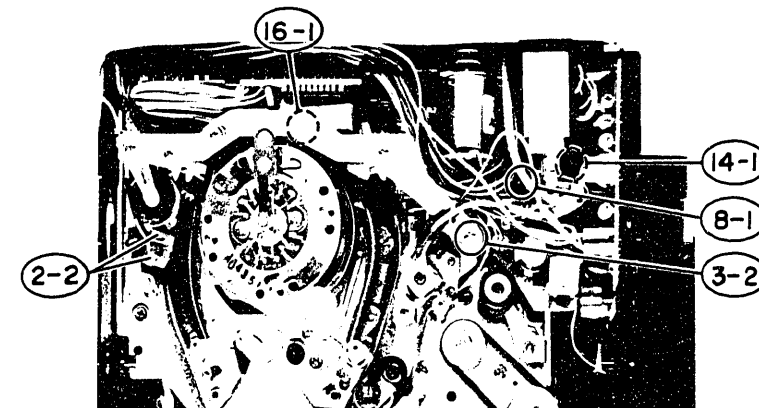


Fig. 22

VT-TU68A

1. PC Board locations

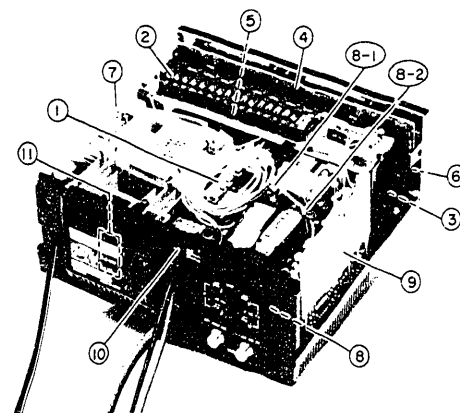


Fig. 23

- | | |
|---------------------------|------------------------------|
| 1. Regulator | 8. Tuner/IF |
| 2. Channel preset | 8-1 Tuner pack |
| 3. Sub U/V tuning | 8-2 IF pack |
| 4. Input key | 9. Remote control |
| 5. Timer | 10. AUX. battery charge jack |
| 6. Infrared rays receiver | 11. Power transistor |
| 7. Rectifier | |

2. Removing the case

1. Top cover (Fig. 24)

- 1) Remove 2 screws.
- 2) Lift up the rear and remove the top cover while pulling it back.

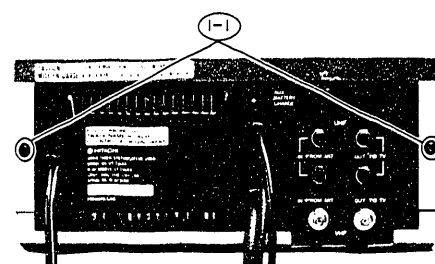


Fig. 24

2. Front cover (Fig. 25)

- 1) Remove 2 screws.
- 2) Remove 2 screws.

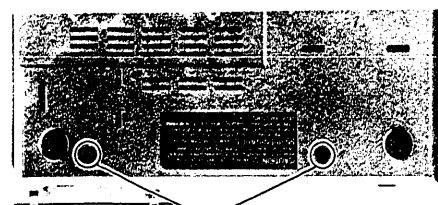
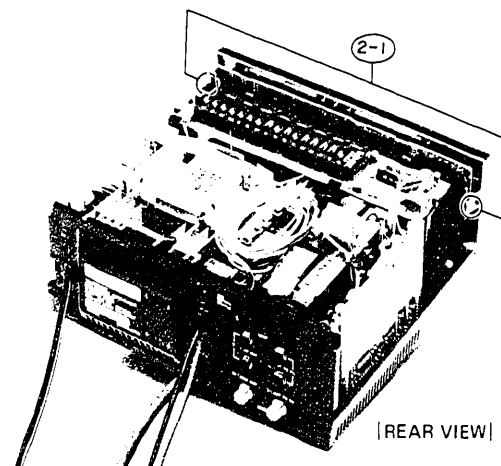


Fig. 25

3. Removing the PC Boards

1. Regulator PC Board (Fig. 26)

- 1) Press 1 stopper in the direction of the arrow to open the PC Board.

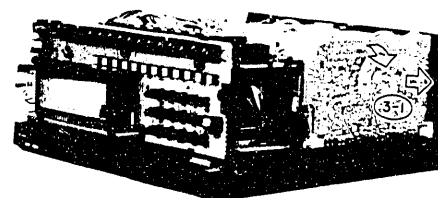


Fig. 26

2. Channel preset PC Board (Fig. 27)

- 1) Press 2 stoppers
- 2) Pull out upward.

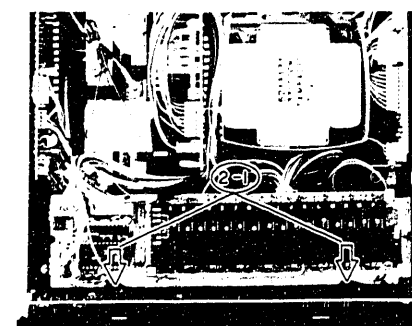


Fig. 27

3. Sub U/V tuning PC Board

- 1) Pull out upward.

4. Input key PC Board (Fig. 28)

- 1) Remove 2 screws.
- 2) Pull out upward.

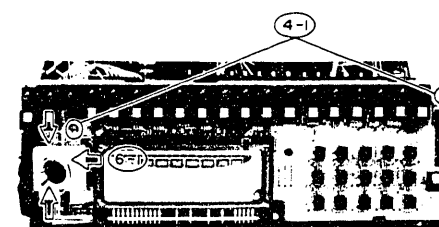


Fig. 28

5. Timer PC Board (Fig. 29)

- 1) Remove 4 screws.
- 2) Remove 2 screws.

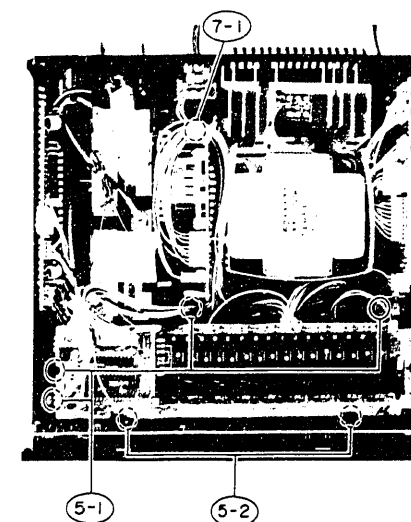


Fig. 29

6. Infrared rays receiver PC Board (Fig. 28)

- 1) Press 3 stoppers.

7. Rectifier PC Board (Fig. 29)

- 1) Remove 1 screw.

8. Tuner/IF PC Board (Fig. 30)

- 1) Remove 5 screws.
- 2) Remove 1 screw.

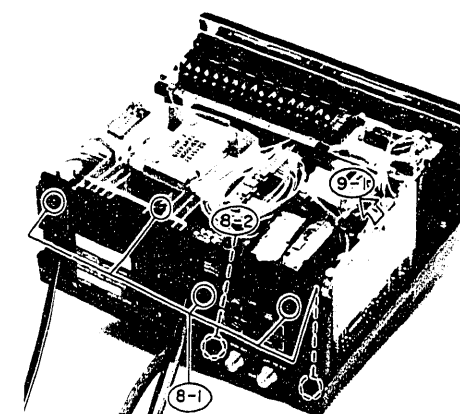


Fig. 30

9. Remote control PC Board (Fig. 30)

- 1) Pull out upward.

10. Aux. battery charge jack PC Board (Fig. 31)

- 1) Press 2 stoppers.
- 2) Pull out upward.

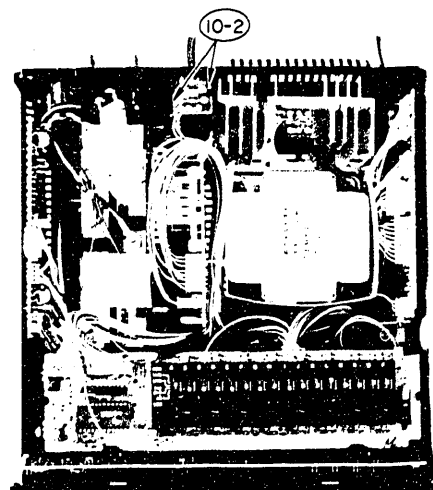


Fig. 31

11. Power transistor PC Board (Fig. 32)

- 1) Remove 2 screws.
- 2) Remove the transistor fixing screw.

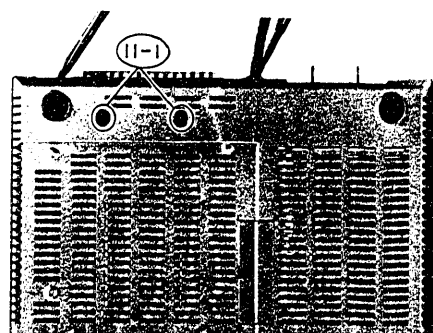


Fig. 32

12. Remote control hand unit (Fig. 33)

- 1) Remove 1 screw.

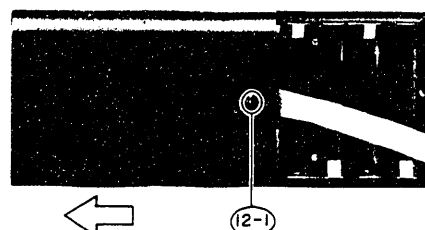


Fig. 33

The upper cover and bottom cover fit tightly, so slide them in mutually opposite directions.

ADJUSTMENT

SERVICING JIGS AND TOOLS

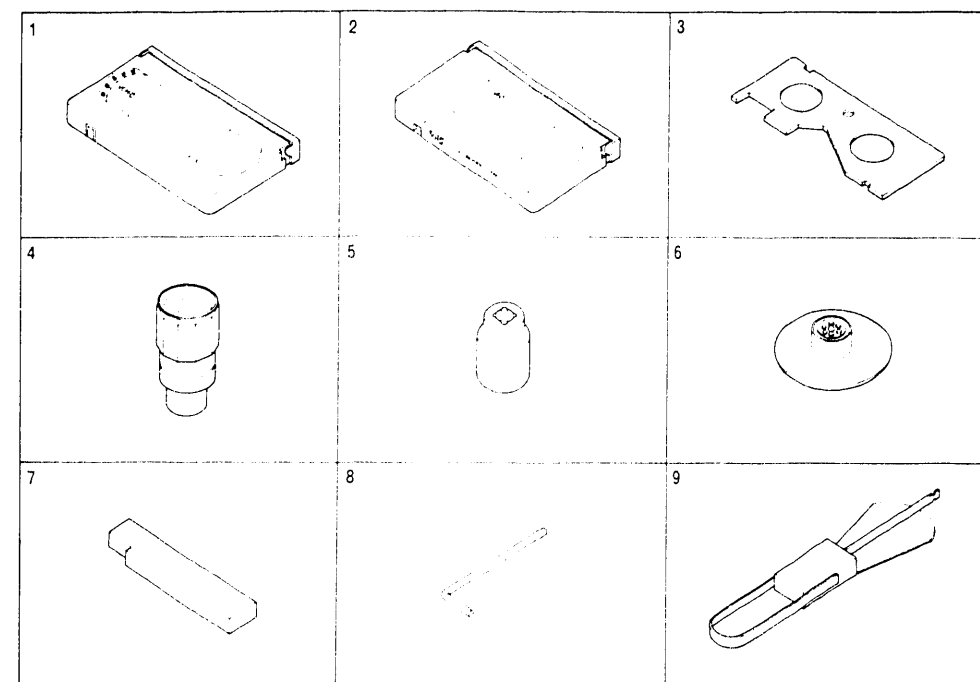


Fig. 34

ITEM	PARTS NAME	P. NO	ITEM	PARTS NAME	P. NO
1.	Back tension meter	7099004	6.	Tension measurement reel	7099043
2.	Alignment tape	7099046	7.	Reel disk height jig	—
3.	Height reference plate (Master plane)	7099041	8.	1.5 mm hexagonal wrench	—
4.	Torque gauge	7099039	9.	Fan type tension gauge	—
5.	Torque gauge adaptor	7099035			

Method of use of torque gauge, torque gauge adaptor
(Measuring medium torque: 50 – 300 gcm)

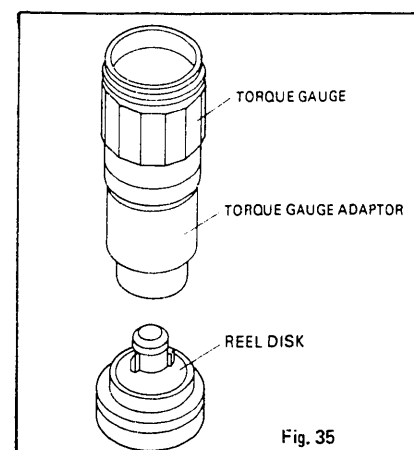


Fig. 35

Method of use of Fan type tension gauge and Tension measurement reel
(Measuring weak torque, strong torque)

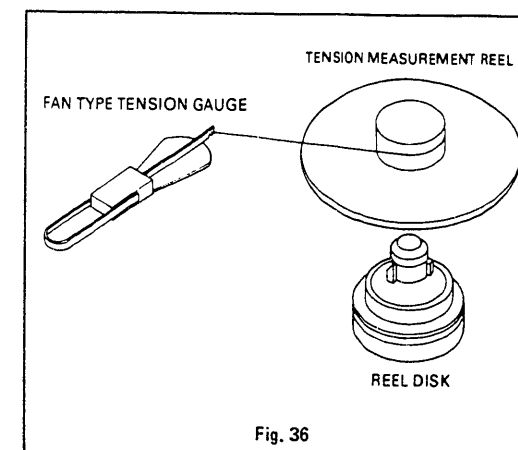


Fig. 36

VT-6800A

1. ELECTRIC CIRCUIT ADJUSTMENT

Power circuit adjustment (System control PC Board)

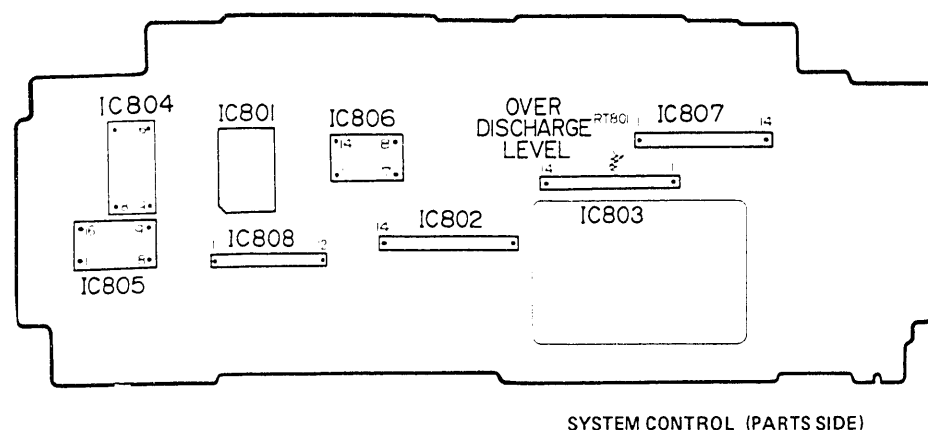


Fig. 1

1. Over-discharge level adjustment

Set the battery over-discharge level by this adjustment. When adjustment is done at a voltage lower than 10.9V, the battery tends to be over-discharged and its service life deteriorates. On the other hand, when it is adjusted at a voltage higher than 10.9V, the usable time per charge is shortened.

- 1) Turn RT801 (OVER-DISCHARGE LEVEL) fully clockwise.
- 2) Connect the DC power supply to the VTR.
Set the output voltage of the DC power supply to 10.9V.
- 3) Turn the power switch on.
- 4) Adjust RT801 (OVER-DISCHARGE LEVEL) so that the pointer of the battery meter is set to the center between the green and red marks.

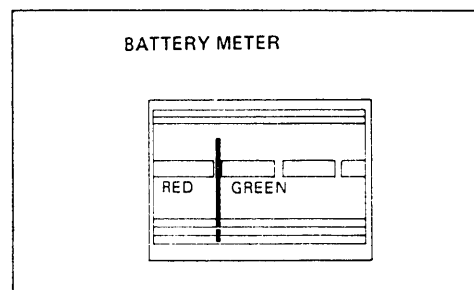


Fig. 1-A

Servo circuit adjustment (Servo PC Board)

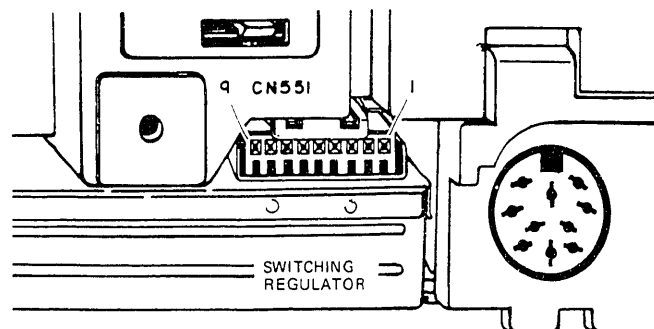


Fig. 2 Adjustment connector location

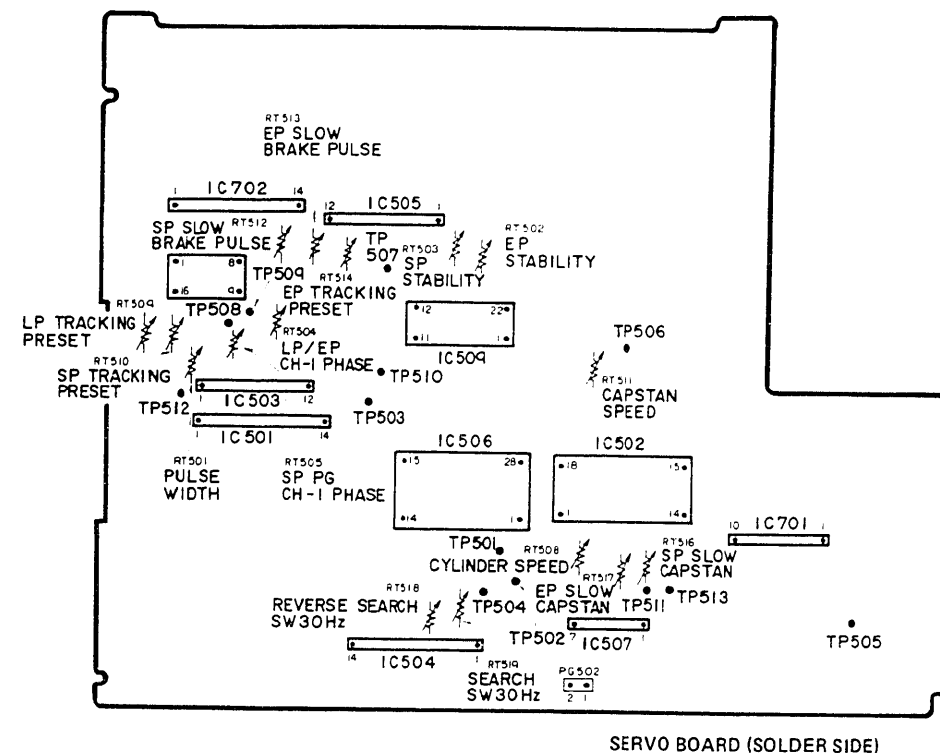


Fig. 2-A

1. Cylinder speed adjustment

This adjustment locks the Cylinder Servo to the system signals and maintains a constant headwheel speed of 1800 R.P.M.

- 1) Record a TV broadcast in the 6Hr mode.
- 2) Short-circuit between CN551-1 and CN551-2.
- 3) Connect the oscilloscope to TP502.
- 4) Adjust RT508 (CYLINDER SPEED) so that the sample pulse is locked on the trapezoid waveform or the sampling pulse flows as slowly as possible on the trapezoid waveform.
- 5) Release short-circuit between CN551-1 and CN551-2.

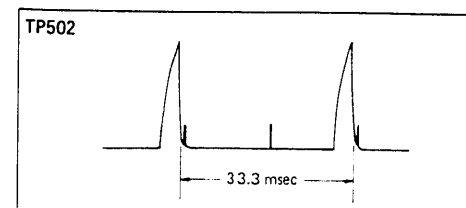


Fig. 3

2. Capstan speed adjustment

This adjustment locks the Capstan Servo to the system signals and maintains tape transport speed.

SP: 3.35 cm/sec
LP: 1.68 cm/sec
EP: 1.12 cm/sec

When this adjustment cannot be done properly, the vertical stability of the picture is degraded.

- 1) Record a TV broadcast in the 6Hr mode.
- 2) Short-circuit between CN551-1 and CN551-2.
- 3) Connect the oscilloscope to TP503.
- 4) Adjust RT511 (CAPSTAN SPEED) so that the sample pulse is locked on the trapezoid waveform or the sampling pulse flows as slowly as possible on the trapezoid waveform.
- 5) Release short-circuit between CN551-1 and CN551-2.

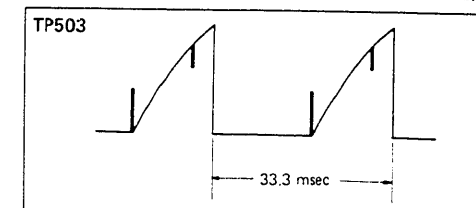


Fig. 4

3. Head switching adjustment

The Tach Pulse MM determines the video head switching point during playback. Misadjustment of either phase shifter (RT505 or RT504) may cause head-switching noise in the picture and/or vertical jitter.

Be sure to adjust in the order; the EP CH-1 phase shifter then the SP CH-1 phase shifter.

- 1) Playback the alignment tape.
- 2) Connect CH-1 of the oscilloscope to the video output terminal and CH-2 to TP205 (SW30Hz) of the luminance/chroma Board.
- 3) Apply synchronization to CH-2 to set the synchronization slope to "—".

EP CH-1 PHASE

- 4) Short-circuit between CN551-5 and CN551-6, and CN551-7 and CN551-8.
- 5) Adjust RT504 (EP CH-1 PHASE) so that the front porch of the vertical synchronization signal is 6.5H.
- 6) Release short-circuits between CN551-5 and CN551-6, and CN551-7 and CN551-8.

SP CH-1 PHASE

- 7) Adjust RT505 (SP CH-1 PHASE) so that the front porch of the vertical synchronization signal is 6.5H.

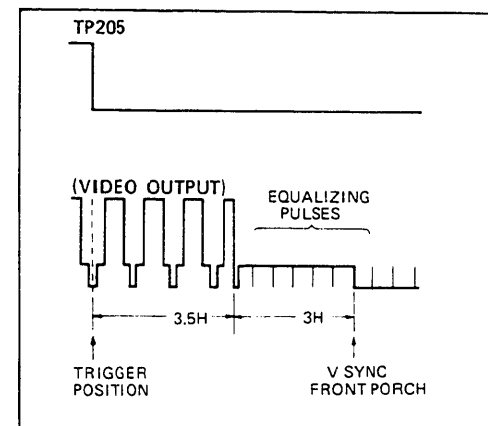


Fig. 5

4. Control pulse recording phase adjustment

This adjustment is done to adjust the phases of the control track pulse and the head switch pulse during recording. Incorrect adjustment may make tape interchangeability impossible. (Drift of tracking may occur when playing tapes recorded by this unit).

- 1) Record a TV broadcast in the 2Hr mode.
- 2) Connect the CH-1 of the oscilloscope to TP205 on the YC board.
- 3) Connect the CH-2 of the oscilloscope to pin 1 of PG502.
- 4) Adjust RT520 (REC CTL PULSE PHASE) so that the positive edge of pulse at TP205 leads 3.5 msec. with the negative trailing edge of pulse at pin 1 of PG502.

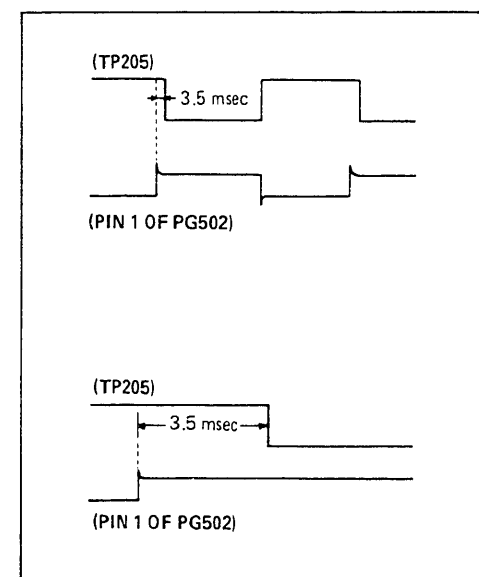


Fig. 6

5. Tracking preset adjustment

Tracking during recording/playback in each mode is done by these adjustments. When one or all these adjustment are not completed, it results in a noisy picture with the tracking control set to the center position.

EP tracking preset

- 1) Record a TV broadcast in the 6Hr mode.
- 2) Connect the oscilloscope to TP507.
- 3) Adjust RT514 (EP TRACKING PRESET) to set the pulse width to 13.5 msec.

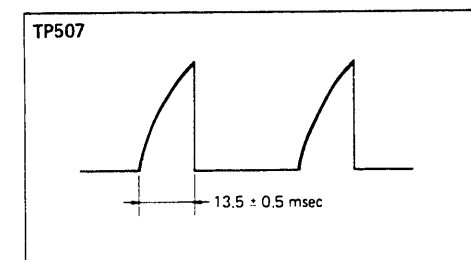


Fig. 7

SP Tracking preset

- 1) Short-circuit between CN551-5 and CN551-6, CN551-7 and CN551-8.
- 2) Record a TV broadcast in the 2Hr mode.
- 3) Connect the oscilloscope to TP202 of the luminance/chroma Board.
- 4) Set the tracking knob to its click position.
- 5) Playback the recorded section.
Adjust RT510 (SP TRACKING PRESET) to maximize the waveform.
- 6) Release short-circuits between CN551-5 and CN551-6, CN551-7 and CN551-8.

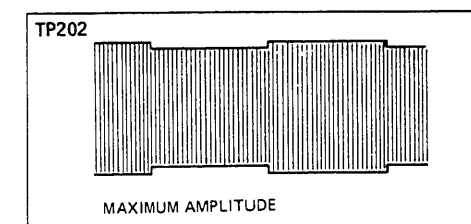


Fig. 8

LP tracking preset

- 1) Record a TV broadcast in the 4Hr mode.
- 2) Connect the oscilloscope to TP202 of the luminance/chroma Board.
- 3) Set the tracking knob to the click position.
- 4) Playback the record section.
- 5) Adjust RT509 (LP TRACKING PRESET) to maximize the waveform.

6. Pulse width adjustment

This adjustment is done to eliminate the 30Hz WOW signal generated by the capstan servo PWM.

- 1) Record a TV broadcast in the 6Hr mode.
- 2) Connect the oscilloscope to TP512.
- 3) Adjust RT501 (PULSE WIDTH) to set the pulse width to 0.72 msec.

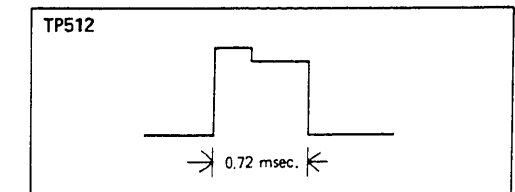


Fig. 9

7. Slow brake pulse adjustment

This controls the intermittent operation brake period of the capstan motor during slow play. When this adjustment is incorrect, random noise may appear in the picture.

EP Slow brake pulse

- 1) Record a TV broadcast in the 6Hr mode.
- 2) Playback the recorded section.
Operate the remote control hand unit and place in the "SLOW" mode.
- 3) Set the fastest slow speed by continuously pressing the slow speed button and also press the right slow tracking button continuously so as not to vary the tracking.
- 4) Connect the oscilloscope to TP505.
- 5) Adjust RT513 (EP SLOW BRAKE PULSE) to set the pulse width to 16 msec.

SP slow brake pulse

- 1) Record a TV broadcast in the 2Hr mode.
- 2) Playback the recorded section.
Operate the remote control hand unit and place in the "SLOW" mode.
- 3) Set the fastest slow speed by continuously pressing the slow speed button and also press the right slow tracking button continuously so as not to vary the tracking.
- 4) Connect the oscilloscope to TP505.
- 5) Adjust RT512 (SP SLOW BRAKE PULSE) to set the pulse width to 23 msec.

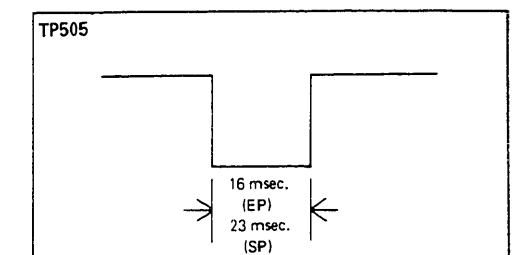


Fig. 10

8. Capstan slow adjustment

This controls the voltage applied to the capstan motor during slow play. When it is adjusted incorrectly, the noise stop position may be unstable or random noise may appear in the picture.

SP capstan slow

- 1) Record a TV broadcast in the 2Hr mode.
- 2) Playback the recorded section.
Operate the remote control hand unit and place in the "SLOW" mode.
- 3) Set the fastest slow speed by continuously pressing the slow speed button.
- 4) Connect the oscilloscope to TP506.
- 5) Adjust RT516 (SP CAPSTAN SLOW) to set the pulse width to 80 msec.
(Range of fluctuation is ± 5 msec)

EP capstan slow

- 1) Record a TV broadcast in the 6Hr mode.
- 2) Playback the recorded section.
Operate the remote control hand unit and place in the "SLOW" mode.
- 3) Set the fastest slow speed by continuously pressing the slow speed button.
- 4) Connect the oscilloscope to TP506.
- 5) Adjust RT517 (EP CAPSTAN SLOW) to set the pulse width to 70 msec.
(Range of fluctuation is ± 5 msec)

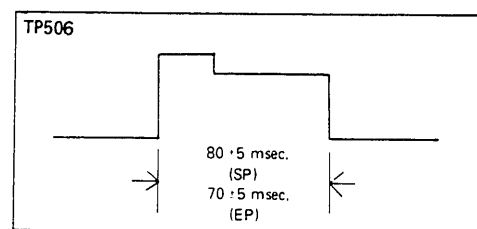


Fig. 11

9. Stability adjustment

This is done to control the lateral shakes of the picture occurring due to the intermittent operation during the slow speed. Incorrect adjustment causes lateral shakes of the picture.

This adjustment is done in sequence with the completion of the capstan slow mode adjustment.

EP stability

- 1) Connect the TV set to the VTR.
- 2) Adjust RT502 (EP STABILITY) to set the lateral shakes during the EP slow mode to a minimum.

SP stability

- 1) Connect the TV set to the VTR.
- 2) Adjust RT503 (SP STABILITY) to set the lateral shakes during the SP slow mode to a minimum.

10. Search SW30Hz adjustment

The duty cycle of the headswitch 30Hz pulse is changed during the search mode.

Because the insertion position of the artificial V pulse is generated from the headswitch 30Hz, incorrect adjustment will cause vertical instability of the picture during the search mode.

This adjustment is done so that this duty cycle is equal.

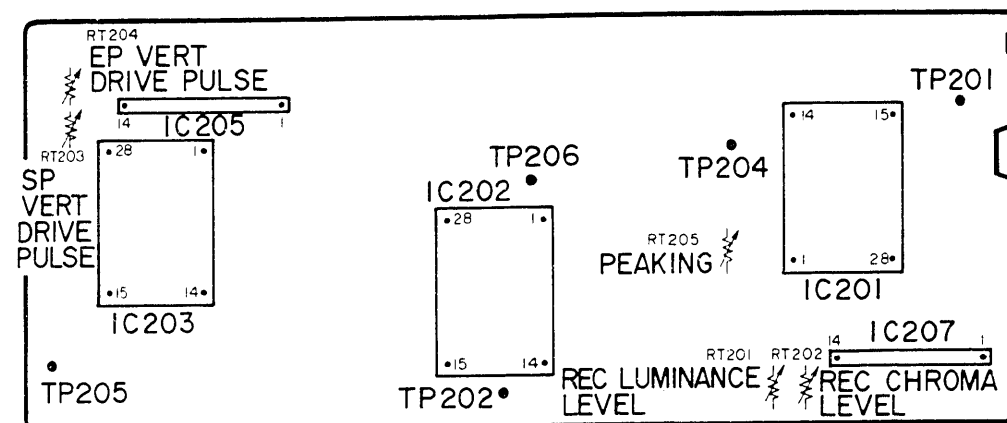
Search SW30Hz

- 1) Record a TV broadcast in the 6Hr mode.
- 2) Playback the recorded section.
- 3) Place the instrument in the "Forward Search" mode.
- 4) Adjust RT519 (SEARCH 30Hz) to eliminate the vertical instability from the picture.

Reverse search SW30Hz

- 1) Record a TV broadcast in the 6Hr mode.
- 2) Playback the record section.
- 3) Place the instrument in the "Reverse Search" mode.
- 4) Adjust RT518 (REVERSE SEARCH 30Hz) to eliminate the vertical instability from the picture.

Luminance/chroma circuit adjustment (Luminance/chroma PC Board)



LUMINANCE/CHROMA BOARD (SOLDER SIDE)

Fig. 12

1. Record chroma level adjustment

Optimum color level when recording is regulated by this adjustment.

When adjustment is not complete and the level is too high, the diamond beats can be seen in the screen; on the other hand, when the level is too low, the color S/N ratio deteriorates, that is, color is degraded.

- 1) Connect color bar generator to the video input terminal.
- 2) Record the color bar in the 6Hr mode.
- 3) Connect the oscilloscope to TP201.
- 4) Turn RT201 (REC LUMINANCE LEVEL) to minimize the waveform.
- 5) Adjust RT202 (REC CHROMA LEVEL) to set the chroma level to 40 mVp-p.

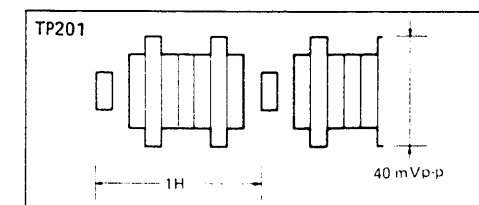


Fig. 13

2. Record luminance level adjustment

Optimum record luminance level is regulated by this adjustment.

When adjustment is not complete and the level is too high, B/W may invert or the S/N ratio may deteriorate, that is, the picture may become rough. On the other hand, when the level is too low, the S/N ratio deteriorates.

- 1) Connect the color bar generator to the video input terminal.
- 2) Record the color bar in the 6Hr mode.
- 3) Connect the oscilloscope to TP201.

- 4) Adjust RT201 (REC LUMINANCE LEVEL) to set the luminance level to 125 mVp-p.

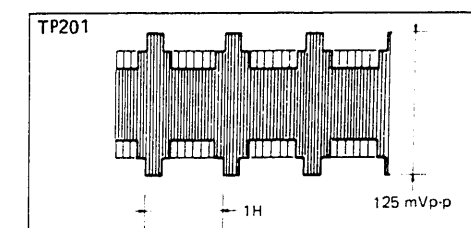


Fig. 14

3. Vertical drive pulse adjustment

The artificial pulse position is determined around the real vert pulse to stabilize the picture in trick play.

When this adjustment is incorrect, the picture in trick play fluctuates.

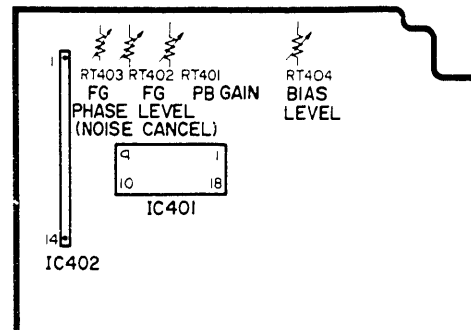
EP vertical drive pulse

- 1) Record a TV broadcast in the 6Hr mode.
- 2) Still-playback the recorded section.
- 3) Adjust RT204 (EP VERT DRIVE PULSE) so that the picture does not fluctuate.
- 4) Set to the SLOW mode and check that the picture does not fluctuate.
- 5) Re-adjust it when any fluctuation occurs.

SP vertical drive pulse

- 1) Record a TV broadcast in the 2Hr mode.
- 2) Still-playback the recorded section.
- 3) Adjust RT203 (SP VERT DRIVE PULSE) so that the picture does not fluctuate.
- 4) Set to the SLOW mode and check that the picture does not fluctuate.
- 5) Re-adjust it when any fluctuation occurs.

Audio circuit adjustment (Audio PC Board)



AUDIO BOARD (PARTS SIDE)
Fig. 15

1. Playback level adjustment

The record/playback level is regulated by this adjustment. When adjustment is not complete and the level is too low, the record/playback level drops and when the level is too high, the record/playback level becomes higher.

- 1) Play back the 1kHz signal of the alignment tape.
- 2) Connect the VTVM to the audio output terminal.
- 3) Adjust RT401 (PB GAIN) to set the level to $-7\text{dB} \pm 1\text{dB}$.

2. Bias level adjustment

Optimum audio record bias is regulated by this adjustment. When adjustment is not complete and the level is too low, high frequencies are boosted and distortion increases. On the contrary, when the level is too high, frequency response deteriorates, that is, high frequencies are degraded.

- 1) Load a blank tape and set the VTR to the record mode.
- 2) Connect the VTVM to 2 pins of the AC head PC Board.
- 3) Adjust RT404 (BIAS LEVEL) to set the level to $1.8 \pm 0.1\text{mVrms}$.

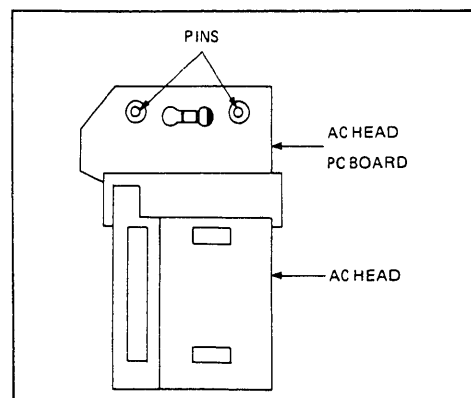


Fig. 16

3. Noise cancel adjustment

120Hz output from the cylinder FG arcing to the audio head becoming noise is prevented by this adjustment.

- 1) Load a blank tape and set the VTR to the PLAY mode.
- 2) Connect the oscilloscope to the audio output terminal.
- 3) Adjust RT402 (FG LEVEL) and RT403 (FG PHASE) alternately to minimize noise in the waveform.

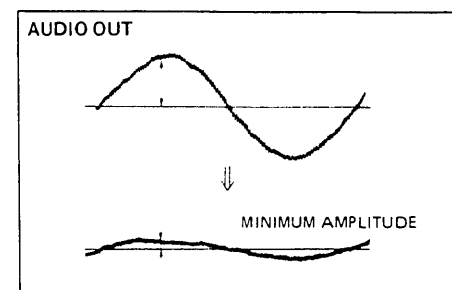


Fig. 17

2. MECHANICAL ADJUSTMENT

Adjusting all parts

1. Cylinder tach head adjustment

Rough adjustment

Loosen the mounting screw and adjust for clearance of $0.6 \pm 0.2\text{mm}$ between the tach head and magnet plate.

Precision adjustment

Connect scope probe (0.2V/div.; 5ms/div.) to pin 2 of IC506 of the Servo Board.

Play back a previously recorded tape and observe the positive polarity pulse.

Adjust the screw to satisfy the following relation;

Value A (positive amplitude) is more than 0.75V,

Value B (negative amplitude) is less than 0.39V.

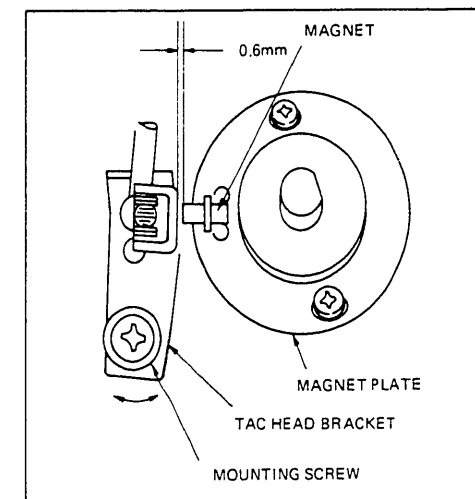


Fig. 18

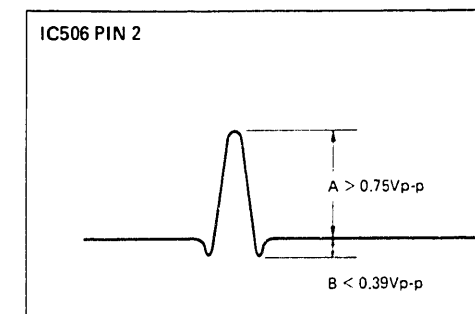


Fig. 19

2. Reel sensor adjustment

- 1) Loosen the reel sensor PC Board fixing screws.
- 2) Tighten screws after setting the interval between the sensor and magnet to less than 1.5 mm.

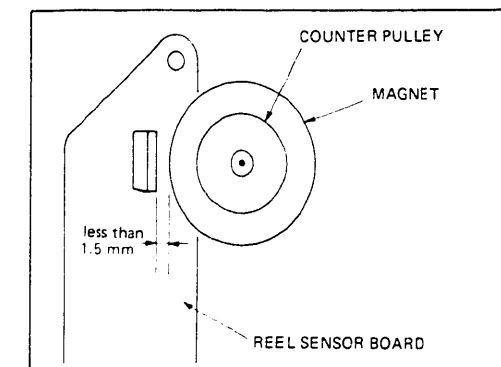


Fig. 20

3. Mechanical state sensor switch adjustment

- 1) Turn the pulley in the unloading direction until it stops.
- 2) Loosen the fixing screw and move the switch so that the V-shaped groove of the switch and the triangular hole match when viewed from the top.
- 3) Tighten the fixing screw.

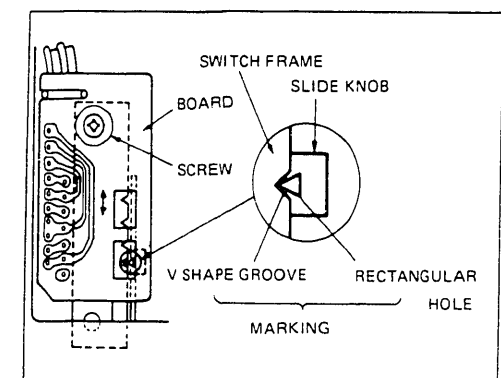


Fig. 21

4. Reel disk height adjustment

- 1) Mount the master plane to the cassette holder and hang the cassette holder.
- 2) Place the Reel disk height jig on the master plane and apply it to the reel disk.
- 3) Adjust the number of spacers (2 types; 0.25 mm thick, 0.5 mm thick) at the bottom of the reel disk to adjust the height of the reel disk so that it can enter between jigs A and B.
(Insert the spacer between the reel disk and the metal washer)

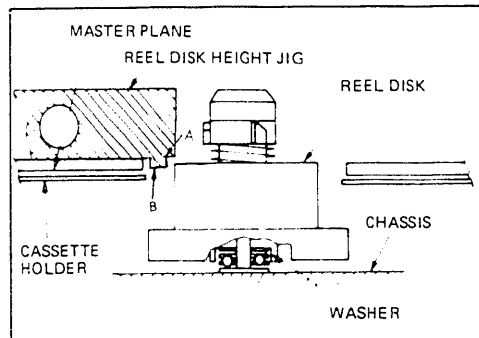


Fig. 22

5. Guide pole adjustment

- 1) Mount the master plane to the cassette holder.
- 2) Place the reel disk height jig on the master plane and lightly press it against the guide pole.
- 3) Turn the nut at the top of the guide pole and set the interval between the top of the square gauge and the top flange to 0.1 ± 0.1 mm.
- 4) Remove the jig.
- 5) Perform "Running adjustment".

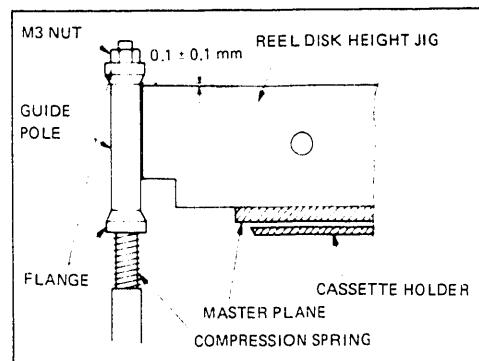


Fig. 23

6. AC (Audio/Control) Head adjustment

Adjust as follows when the AC head is replaced.
When an alignment tape is used with an incomplete tape transport, the alignment tape may be damaged. Adjust the alignment tape roughly using the height reference plate and reel height adjustment jig, then run a blank tape to check by eye whether or not any curling or creasing occurs at the AC head and guide pole before use.
Do not touch the guide pole by hand when adjusting the AC head.

Rough adjustment

- 1) Place the reel disk height adjustment jig on the master plane, bring the right-angled section of the reel disk height jig nearer to the front of the AC head and adjust the tilt adjustment screw of the AC head so that the front of the AC head and the surface of the reel height adjustment gauge are parallel.
- 2) Adjust the azimuth adjustment screw in the same way as in item 1) so that the side of the AC head and surface of the reel height adjustment jig are parallel.
- 3) Load the blank tape and set this unit to the PLAY mode. Observe the tape transport condition around the AC head and adjust the height adjustment nut so that relation between the tape and the AC head position is as shown in Fig. 25.
- 4) Apply precision adjustment as follows.

Precision adjustment

Perform precision adjustment using an alignment tape after the tape transport around the AC head is smooth.

Tilt adjustment

- 1) Connect the oscilloscope to the audio output terminal.
- 2) Play back the audio 7 kHz signal (video signal becomes a step wave at that time) of the alignment tape, turn the tilt adjustment screw shown in Fig. 24 a little to adjust so that the audio output level is max.
- 3) Adjust the tilt adjustment screw so that the maximum output with minimum fluctuation is obtained. (Turning the tilt adjustment screw not only change the AC head height but also head inclination.)

Azimuth adjustment

- 1) Connect the oscilloscope to the audio output terminal.
- 2) Playback the 7 kHz audio signal of the alignment tape.
- 3) Adjust the azimuth adjustment screw so that the output becomes maximum.

Height adjustment

- 1) Connect the oscilloscope to the audio output terminal.
- 2) Playback the 7 kHz audio signal of the alignment tape.
- 3) Adjust the height adjustment nut so that the output becomes maximum.

X value adjustment

- 1) Check that tape transport is normal.
- 2) Check or adjust the audio noise canceller, audio playback gain and audio bias level of the audio circuit.
- 3) Adjust the X value by the following procedure.
In this unit, 4 video heads with different head width are installed in the upper cylinder.

Play back the alignment tape recorded with the video track width of $58\mu\text{m}$, tape speed at 33.3 mm/s (SP) to adjust the X value. It is traced with the video head width of $75\mu\text{m}$ in CH1 and $90\mu\text{m}$ in CH2, with respect to the video track width of $58\mu\text{m}$ of the alignment tape. As a result, the video head width is wider than the video track, the FM output shown in Fig. 26 is obtained when the tracking control is turned.

Point A (CH-1) and point B (CH-2) shown in the diagram show the points where the FM output starts to drop when the tracking control is turned counterclockwise from the click position.

Point D (CH1) and point B (CH2) show the points the FM output starts to drop when the tracking control is turned clockwise from the click position. It is best that the click position of the tracking control is in the middle between point A and point B when the tracking control is set at the click position.

When the X value adjustment screw is turned in the direction the same as the tracking control, the graph in Fig. 26 is obtained.

Check the X value position by turning the tracking control. If the value B positioned between B and C, turn the X value adjustment screw counterclockwise to obtain the X value adjustment position between A and B.

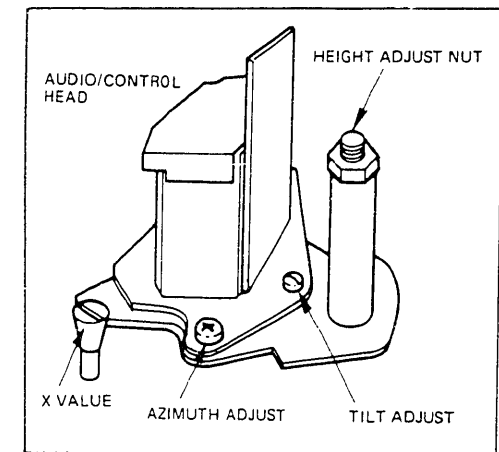


Fig. 24

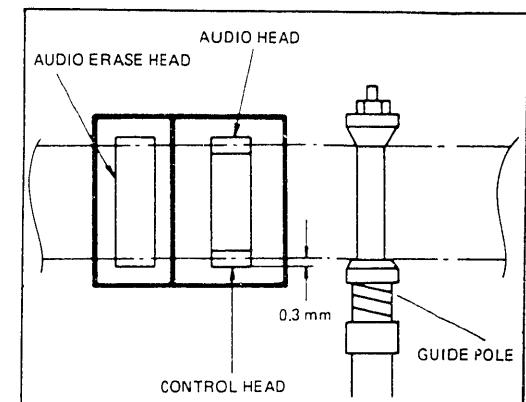


Fig. 25

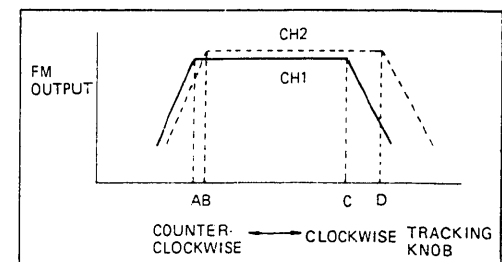


Fig. 26

Adjustment method

- 1) Connect the oscilloscope to TP205 (SW30Hz) and TP202 (FM output) on the YC PC Board, and observe the FM envelope signal and the SW30 signal to check the CH1 and CH2 switching point of the FM envelope output.
- 2) Play back the alignment tape, set the tracking control to the click position and then adjust the X value adjustment screw so that both FM envelope outputs of CH1 and CH2 are max. The X value adjustment point is between points B and C when this adjustment is completed.
- 3) Adjust the X value to the max. point of the FM output and then turn the X value adjustment screw counterclockwise gradually to the position where the FM output of CH1 keeps constant at the max. and the FM output of CH2 starts to drop. The X value positions at point B when this adjustment is completed.
- 4) The FM outputs of CH1 and CH2 should be constant when the tracking control is turned approx. 90° clockwise from the click position. Turn the tracking control 5 ~ 10° counterclockwise from the click position and check that the FM output of CH1 is constant and the FM output of CH2 starts to drop. When it is drifted, re-adjust the X value.

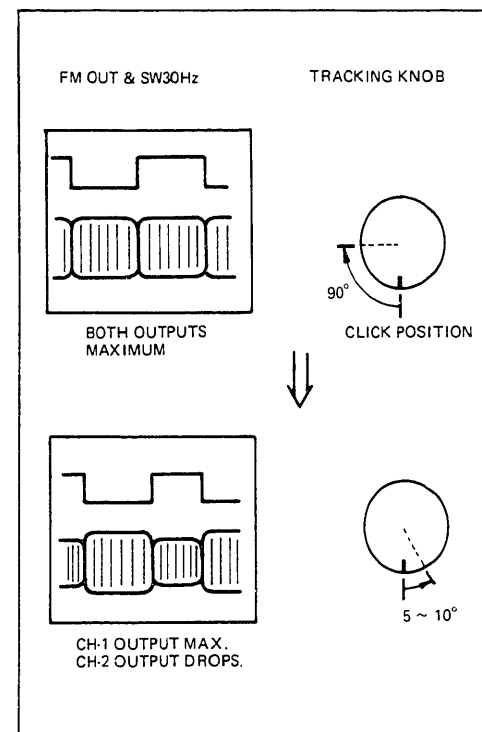


Fig. 27

7. Tension pole position and tension adjustment

Position adjustment

- 1) Cover the light-receiving port of the supply end sensor using paper, etc.
- 2) Set the VTR to the PLAY mode without loading a tape.
- 3) Loosen the tension band fixing screw and put a screwdriver between the band holder and the groove in the chassis.
- 4) Move the band holder using the screwdriver, and set the gap between the tension arm and the fixed guide to 1.0 ± 0.5 mm.
- 5) Set the VTR to the STOP mode and tighten the screw.

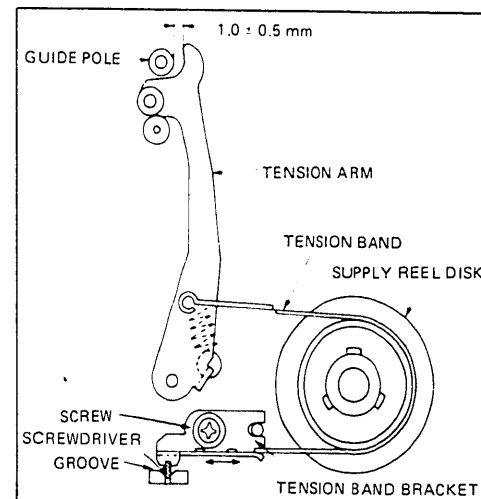


Fig. 28

Tension adjustment

- 1) Loosen the spring holder fixing screw.
- 2) Mount the back-tension meter and set the VTR to the PLAY mode.
- 3) Put a screwdriver in the tension adjustment groove on the left side of the set.
- 4) Move the spring holder and set the tension to 30 ~ 45g cm.
- 5) Set the VTR to the STOP mode and tighten the screw. Check the pole position after adjusting tension. When both values are not satisfied, repeat adjustment.
- 6) Remove the paper used for covering the sensor after adjustment is completed.

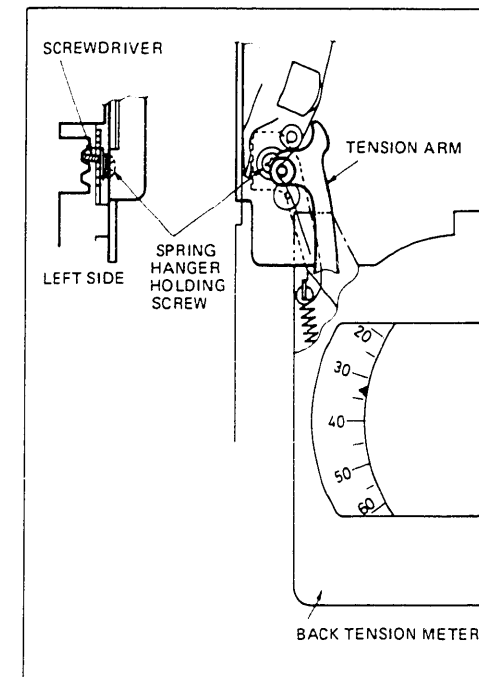


Fig. 29

8. Inclined guide adjustment

- 1) Run a blank tape.
- 2) Loosen the inclined guide fixing screw.
- 3) Move the guide to set so that no crease or curl occurs, and then lock the fixing screw. Be sure not to turn the guide roller fixing screw at this time.
- 4) Perform "Running adjustment".

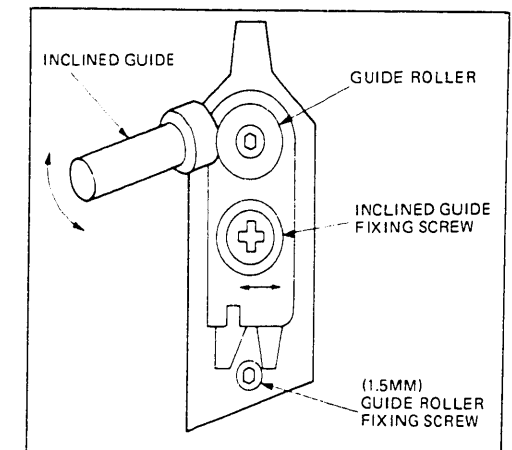


Fig. 30

Checking torques of all parts

The measured values listed below are reference values.

	Item	Mode	Measured reel	Measured value
1	Main brake torque	STOP	Both reels	200 gcm or more
2	Slack removal torque	Unloading	Supply reel	100 ~ 200 gcm
3	Rewind	REW	Supply reel	400 gcm or more
4	Take-up	PLAY	Take-up reel	70 ~ 120 gcm
5	FF	F. FWD	Take-up reel	400 gcm or more
6	Supply back-tension	F. FWD	Supply reel	4 ~ 15 gcm
7	Take-up back-tension	REW	Take-up reel	4 ~ 15 gcm
8	Take-up brake torque	(1) ◀◀ Visual search (2) Loading (3) Unloading (4) REC Pause	Take-up reel	80 ~ 140 gcm
9	Search torque	◀◀ Visual search	Supply reel	230 ~ 300 gcm

Tape transport adjustment

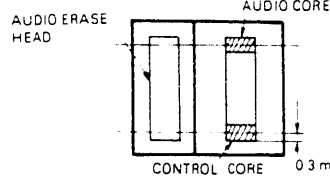
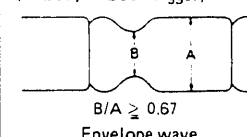
In the tape transport system, it is basic and important that the tape transport path between the supply reel disc and take-up reel disc is clean and stable with respect to the tapes without creases.

The tape transport is adjusted precisely in the factory, taking the greatest care. When parts related to this section are replaced, the tape transport should be made stable by

adjusting the parts replaced.

Be careful in that when the replaced parts are not adjusted or when parts other than the replaced parts are moved, good results cannot be obtained.

Do not remove and adjust the catcher which holds the guide roller and the tilt guide because they are adjusted completely in the factory using precision jigs.

Check item	Judgement	Tool/measuring instrument
Back-tension	30 ~ 45 gr/cm (VTR horizontal)	Back-tension meter
Guide pole	Tape should slide along the lower flange and not crease or curl.	By eye
Inclined guide and guide roller	Conspicuous creases or curls not present in tape. No adherence of dust.	By eye
Tape	Conspicuous distortion of the tape or change should not be present.	By eye
Impedance roller	Roller should rotate smoothly	By eye
AC head	Tape should keep contact fully with the control head core and audio head core. 	By eye Diagram on the left shows reference values.
Envelope	Conspicuous fluctuation should not be present	Alignment tape Oscilloscope
Playback staircase wave from alignment tape	Flatness Fluctuation X value	Set the envelope to 75% of the max. amplitude using the tracking VR; the min. amplitude should be 50% or more of the original max. amplitude (Note-1). The fluctuation in width of the envelope should be 13% or less. Envelope should be within 95% or more of max. with the tracking knob set to the click position.  $B/A \geq 0.67$ Envelope wave

Adjust the positions shown below depending on the parts replaced when parts are refitted or replaced.

1. When the upper cylinder is replaced.

	Judgement
Guide roller height	Creases and curls should not occur in the tape
Inclined guide angle	Check fluctuation and flatness of the envelope
X value position	(Check X value, AC head position, switching point, rec luminance/chroma level) Check following adjustment Page. 32 Section 3 CH1 phase adjustment (head switching point). Page. 33 Section 5 Tracking preset adjustment. Page. 35 Sections 1, 2 Record level and Record luminance level adjustment.

2. When the AC head is replaced

	Judgement
AC head height	Check the audio or control track width
AC head azimuth	Maximize audio playback level
AC head tilt	No slack at the top and bottom of the tape
X value position	Conspicuous audio level fluctuation should not be present

3. When the guide roller and inclined guide are replaced.

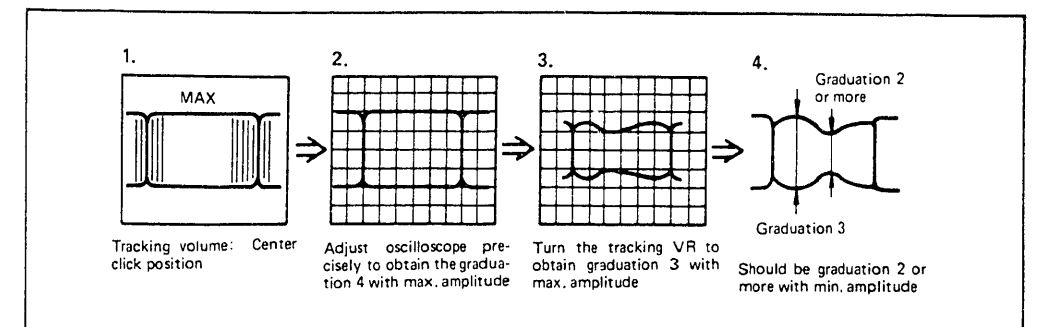
Same as in item 1.

4. When the guide pole is replaced.

	Judgement	Tool
Guide pole height	No creases or curls should be present. Envelope should not fluctuate	Nutdriver Oscilloscope

(Note-1) Simple method of checking the flatness of the envelope

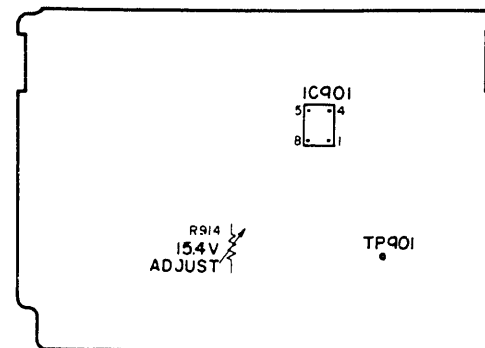
- Set the tracking VR to its center click position. (Envelope at this time should be max.)
- Adjust the amplitude range of the oscilloscope precisely to set the envelope to graduation 4.
- Turn the tracking VR to minimize the max. amplitude at graduation 3.
- Check that the smallest amplitude is graduation 2 or more at that time.



VT-TU68A

ELECTRIC CIRCUIT ADJUSTMENT

Regulator circuit adjustment



REGULATOR BOARD (PARTS SIDE)
Fig. 31

1. 15.4V adjustment

The VTR operation voltage is regulated by this adjustment. Adjustment by setting the battery charge voltage is done while taking the charge function of the battery into consideration.

When adjustment is not complete and the value is set too high, the service life of the battery is shortened.

On the other hand, when the value is set too low, the battery charge is insufficient and the VCR operation time per charge is shortened.

- 1) Connect VTVM to TP901 on the Regulator board.
- 2) Connect a 75 ohm 3 watt resistor between the Aux. Battery Jack and ground.
- 3) Adjust R914 (15.4V ADJUST) to set the voltage to 15.4V.
- 4) Remove the resistor, short pins 8 and 10 together on the "Tuner/Adapter" plug.
- 5) The voltage should read $12.5 \pm 0.5V$.

Tuner/IF circuit adjustment

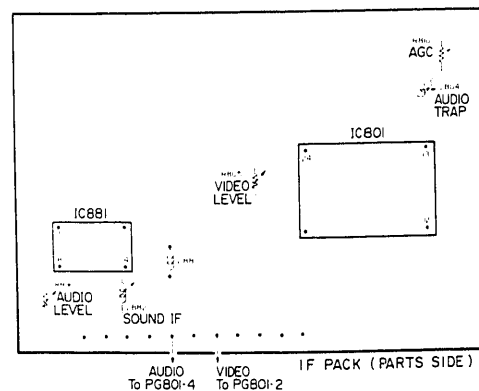


Fig. 32

1. Carrier filter and video level adjustment.

- 1) Connect the pattern generator to the VHF antenna terminal.
- 2) Connect the oscilloscope to PG801 - 2.
Set the range of the oscilloscope to "DC".
- 3) Turn the power on.
- 4) Receive the white pattern, and turn the core of L805 (CARRIER FILTER) gradually counterclockwise from the fully clockwise position so that the level between the sync tip and the white peak is minimum.
(The input level at that time should be $-41dB \pm 10dBm$ at the IF terminal of the IF pack).

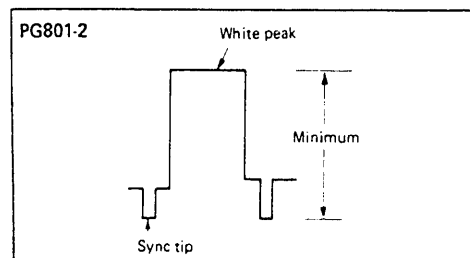


Fig. 33

- 5) Adjust R805 (VIDEO LEVEL) to obtain the level of 1Vp-p between the sync tip and the white peak.

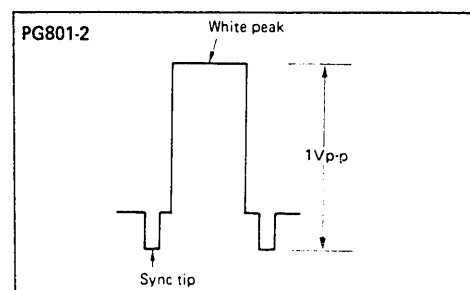
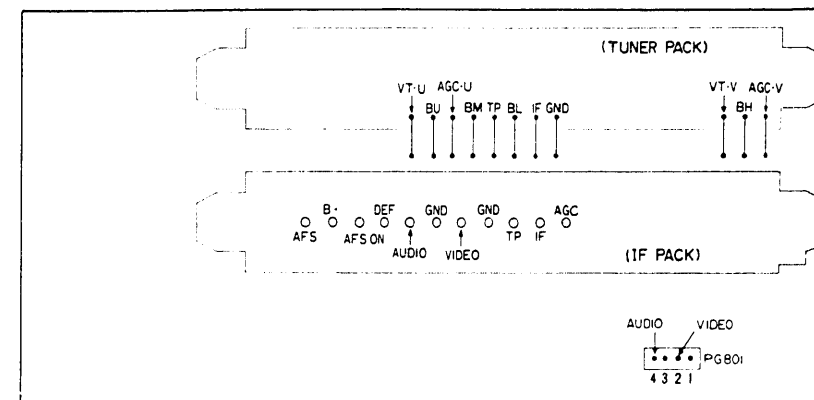


Fig. 34

2. Audio level adjustment

- 1) Connect a pattern generator to the antenna input of the tuner unit.
- 2) Set the antenna input signal to $-41 \pm 10dBm$, 30% modulation audio signal at 400Hz.
- 3) Connect the VTVM to the audio output terminal of the IF pack.
- 4) Adjust R890 (AUDIO LEVEL) so that the reading of the VTVM is $-15dB \pm 1.5dB$.



TUNER/IF BOARD (PARTS SIDE)

Fig. 35

3. 4.5MHz trap and AFS adjustment

- 1) Connect the sweep generator (40 - 55MHz) to the IF terminal of the IF pack via the coupler circuit shown below.

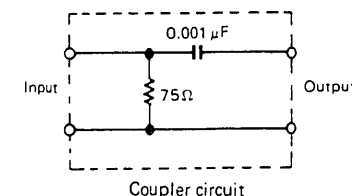


Fig. 36

- 2) Loose-couple the marker generator (41.25MHz) to the sweep generator.
- 3) Connect the oscilloscope to the TP terminal of the IF pack.
- 4) Connect the 50Ω resistor in series to L805.
- 5) Ground IC801 pin 22.
- 6) Set the power to ON.
- 7) Adjust L804 (4.5MHz TRAP) to set the output of the 41.25MHz marker section to minimum after generating the PIF waveform shown below.

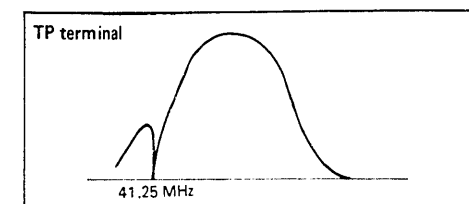


Fig. 37

- 8) Set the marker to 45.75MHz.
- 9) Connect the oscilloscope to PG801 pin 2 and adjust the output of the sweep generator so that the waveform appearing at this is 1Vp-p.

- 10) Connect the oscilloscope to the AFS terminal of the IF pack and set it to the DC range.
- 11) Adjust L806 (AFS) so that the potential at the marker point is $6.5 \pm 1.0V$.

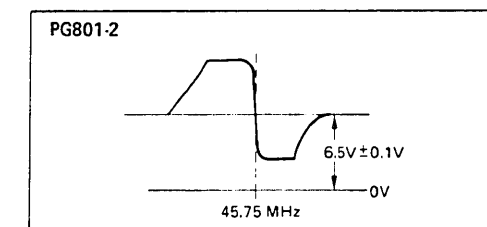


Fig. 38

4. SIF adjustment

- 1) Connect the AM signal generator to the coupling point of R881 and L881 inside the IF pack via the coupler circuit shown in the diagram below.

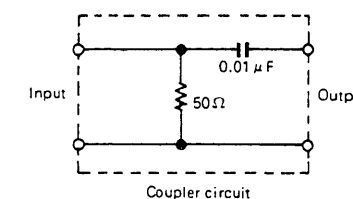


Fig. 39

- 2) Ground IC881 pin 6.
- 3) Connect the oscilloscope to PG801 pin 4.
- 4) Set the power to ON.
- 5) Set the output of the signal generator to $-75 \sim -55 dBm$ (4.5 MHz $\pm$ 5 kHz, 400 Hz, 30% AM)
- 6) Adjust L882 (SIF) so that the amplitude of the output waveform is minimum.

5. PIF adjustment

- 1) Connect the sweep generator (40 ~ 50 MHz) to the TP terminal of the IF pack via the coupler circuit shown in Fig. 36.
- 2) Loose-couple the marker generator (41.25 MHz, 42.17 MHz, 45.75 MHz) to the sweep generator.
- 3) Connect the oscilloscope to the TP terminal of the IF pack.
- 4) Ground IC801 pin 22 inside the IF pack.
- 5) Connect a 50 Ω resistor in series to L805.
- 6) Set the power to ON, and select one of the VHF channels.
- 7) Adjust the tuner IFT so that the levels of all marker points of the PIF waveform are within the specification shown in the diagram below.

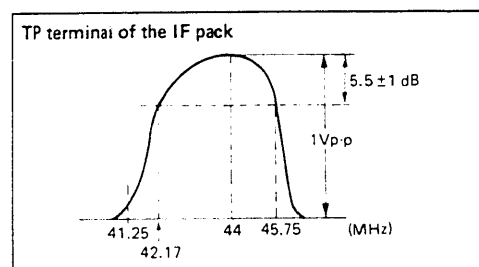
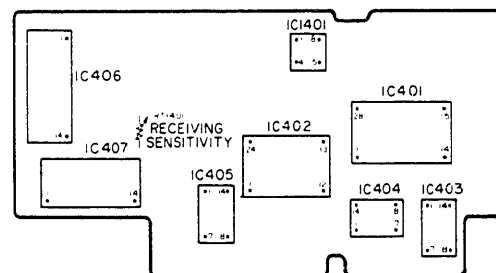


Fig. 40

6. AGC adjustment

- 1) Connect the pattern generator to the VHF antenna terminal.
- 2) Connect the VTVM to AGC-V of the tuner pack.
- 3) Turn the power ON.
- 4) Apply a non-modulated signal (input level, -49dBm) to the VHF antenna terminal.
- 5) Adjust R810 (AGC) so that the reading of the VTVM is $9.2 \pm 0.1V$.

Remote control circuit adjustment



REMOTE CONTROL BOARD (PARTS SIDE)

1. Reception sensitivity adjustment

Adjust so that sensitivity of the receiver is optimum. When sensitivity is too low, it becomes resistant to interference (ambient light) but operation from a distance becomes difficult; when sensitivity is too high, it becomes difficult to use near a fluorescent lamp or in a bright place.

- 1) Check that the remote control transmitter is normal and the VTR and tuner are normal.
- 2) Bring the transmitter 15 - 20m away from the receiver. (More than 10m in specifications)
Set the light receiving section of the tuner and the light transmission window to be in a straight line.
- 3) Keep the play operation button of the remote control unit pressed until adjustment is completed.
- 4) Turn RT1401 (RECEIVING SENSITIVITY) gradually counterclockwise from fully clockwise (viewed from the parts side of the PC Board) until the play indicator just lights.

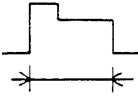
ADJUSTMENT LIST VT-6800A

(System Control Board)

Adjustment item	Test point	Measuring instrument and operation	Adjusted position	Measured value
Overdischarge level	battery meter	Connect DC power supply to internal Battery jack, and set to DC10.9V	RT801	Set the pointer to the center between green and red marks.

(Servo Board)

Cylinder speed	TP502	• Oscilloscope • 6Hr recording Short-circuit Open	RT508	Pulse approximately stops at triangular wave Waveform locked
Capstan speed	TP503	• Oscilloscope • 6Hr recording • CN551-1, CN551-2 Short-circuit Open	RT511	Pulse approximately stops at triangular wave Waveform locked
Head switching	Video output terminal	• Oscilloscope: Synchronized by TP205 • Alignment tape: playback LP/EP CH-1 phase SP CH-1 phase	RT504 RT505	Front porch 6.5H after the edge of sync waveform (SW30)
REC CTL pulse phase	PG502-1	• Oscilloscope: TP205 trigger • 2Hr recording: Color bar (TV signal)	RT520	
Tracking preset (EP)	TP507	• Oscilloscope • 6Hr recording: Color bar (TV signal)	RT514	
Tracking preset (SP, LP)	TP202	• Oscilloscope • Tracking knob: Center click position • CN551-5 and CN551-6, CN551-7 and CN551-8 short-circuit (During SP mode) • Recording: Color bar (TV signal) SP tracking preset LP tracking preset	RT510 RT509	Envelope at max.
Pulse width	TP512	• Oscilloscope • 6Hr recording: Color bar (TV signal)	RT501	0.72 msec width
Slow brake pulse	TP505	• Oscilloscope • Recording: Color bar (TV signal) "SLOW" mode • Slow speed: FAST • Slow tracking: upward	RT513 RT512	

Adjustment item	Test point	Measuring instrument and operation	Adjusted position	Measured value
Capstan slow	TP506	- Oscilloscope - Recording: Color bar (TV signal) ↓ "SLOW" mode - Slow speed: FAST		 80 msec (SP) 70 msec (EP)
		SP Capstan slow EP Capstan slow	RT516 RT517	
Stability	TV set	- TV set - Recording: Color bar (TV signal) ↓ "SLOW" mode		Lateral instability is eliminated from the picture.
		EP stability SP stability	RT502 RT503	
Search SW30Hz	TV set	- TV set - Recording: Color bar (TV signal) ↓ "Forward Search" mode "Reverse Search" mode		Vertical instability is eliminated from the picture.
		Search 30Hz Reverse search 30Hz	RT519 RT518	

(Luminance/chroma Board)

REC chroma level	TP201	- Oscilloscope - Video input terminal: Color bar 6Hr recording	RT202	40 mVp-p
REC luminance level	TP201	- Oscilloscope - Video input terminal: Color bar 6Hr recording	RT201	125 mVp-p
Vert. drive pulse	TV set	- TV set 6Hr recording, 2Hr recording ↓ "Still" mode ←		Adjust so that picture does not fluctuate
		EP Vert. drive pulse SP Vert. drive pulse	RT204 RT203	

(Audio Board)

Play level	Audio output terminal	- VTVM - Alignment tape: 1kHz PLAYBACK	RT401	-7dB ±1dB
Bias	AC head test pin	- VTVM - Record mode	RT404	1.8 ±0.1mVrms
Noise cancel	Audio output terminal	- Blank tape: PLAY mode - Oscilloscope	alternately RT402 RT403	Minimum noise

VT-TU68A

(Regulator Board)

15.4V	TP901	- Voltmeter 75 ohm 3 watt resistor to aux. battery charge jack	R914	15.4V $\pm 0.2V$
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(Tuner/IF Board)

Carrier filter	PG801-2	- VHF antenna terminal: Pattern generator - Oscilloscope: DC range - Input level: $-41dB \pm 10dBm$ (at IF pack terminal)	L805	Minimum amplitude
Video level	PG801-2	- VHF antenna terminal: Pattern generator - Oscilloscope: DC range - Input level: $-41dB \pm 10dBm$ (at IF pack terminal)	R805	1 Vp-p
Audio level	Audio output terminal of IF pack	- VHF antenna terminal: Pattern generator - Input level: $-41dB \pm 10dBm$ (at IF pack terminal) - VTVM: Audio output terminal of IF pack	R890	$-15dB \pm 1.5dB$
4.5MHz trap	TP terminal	- Sweep generator: 40 ~ 55MHz - Marker generator: 41.25MHz - Oscilloscope - Connect the 50Ω resistor in series to L805 - IC801-22 pin: Ground	L804	41.25MHz marker section is minimum
AFS	AFS terminal	- Marker generator: 45.75MHz - Oscilloscope - Sweep generator: PG801-2 at 1Vp-p	L806	
SIF	PG801-4	- AM signal generator: Coupling point of R881 and L881 inside the IF pack. - IC881-6 pin: Ground - Oscilloscope	L882	Output waveform is minimum.
PIF	TP terminal	- Sweep generator: Coupling point of TP terminal. - Marker generator: 41.25, 42, 17, 45, 75MHz - Oscilloscope - IC801-22 pin: Ground - Connect the 50Ω resistor in series to L805. - Select one of of the VHF channels.	Tuner IFT	
AGC	AGC-V terminal	- Pattern generator: Coupling point of VHF antenna terminal - VTVM	R810	9.2V $\pm 0.1V$

(Remote control Board)

Receiving sensitivity	Play indicator of VTR	- Connect VTR and TUNER - Remote hand unit: 15 m away from the Tuner - Keep pressing remote play button - RT1401: Fully counter clockwise	RT1401	Play indicator lights
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Note

1. Voltage measured at base of chassis with minimum volume control and no signal
2. Nomenclature of Resistors and Capacitors

Circuit No.	
Value	No indicated Ω (Ohm) M: 1000 k Ω
Tolerance	No indicated $\pm 5\%$ K: $\pm 10\%$ M: $\pm 20\%$
Wattage	No indicated $\frac{1}{4}W$
Sort	No indicated Carbon film RC: Composition RW: Wire wound RS: Oxide metal film RN: Fixed metal film

Circuit No.	
Value	No indicated μF P: pF
Tolerance	No indicated $\pm 10\%$ J: $\pm 5\%$ M: $\pm 20\%$ Z: $\pm 80\%$ 20% D: $\pm 0.5pF$ C: $\pm 0.25pF$
Sort	Ceramic Electrolytic Mylar Polyester Styrol
Voltage	No indicated 50WV

3. Be sure to make your orders of resistors and capacitors with value, voltage, tolerance and sort.

DIAGRAM

Cautions on use of MOS IC

1. The MOS IC is inserted in black foam for shipment. This foam is a conductor which short-circuits between the leads to prevent damage. Do not remove ICs from this foam during their storage. Avoid removing ICs from this foam, placing them on plastic which is likely to be charged with static electricity or inserting them into styrol foam.
2. High voltages may be applied during soldering caused by leakages from the soldering iron, so be sure to ground the tip of the soldering iron or use a low voltage soldering iron.
3. The human body, clothes made of synthetic fibres or nylon gloves may be charged with several thousands volts of static electricity because of friction, so a workers should be grounded.
4. Be sure to ground measuring instruments such as oscilloscope, VTVMs, etc. used for repairs.

SEMICONDUCTOR

Transistor



2SA673
2SA844

IC



PC1458

11



HA11713

SEMICONDUCTOR CONFIGURATION LIST

on use of MOS IC

MOS IC is inserted in black foam for shipment. foam is a conductor which short-circuits between leads to prevent damage. Do not remove ICs from foam during their storage. Avoid removing ICs from foam, placing them on plastic which is likely to be charged with static electricity or inserting them into solder.

High voltages may be applied during soldering caused by sparks from the soldering iron, so be sure to ground the tip of the soldering iron or use a low voltage soldering iron.

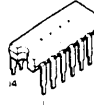
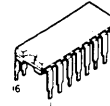
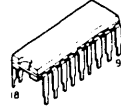
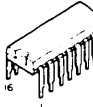
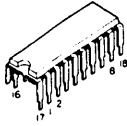
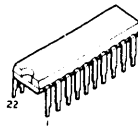
Human body, clothes made of synthetic fibres or gloves may be charged with several thousands of volts of static electricity because of friction, so a workbench should be grounded.

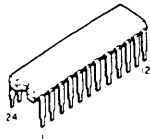
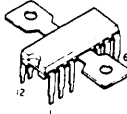
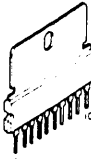
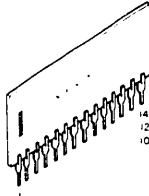
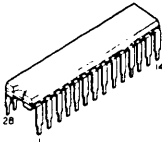
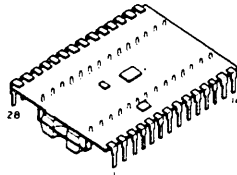
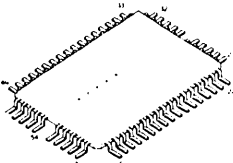
Be sure to ground measuring instruments such as oscilloscope, VTVMs, etc. used for repairs.

Transistor

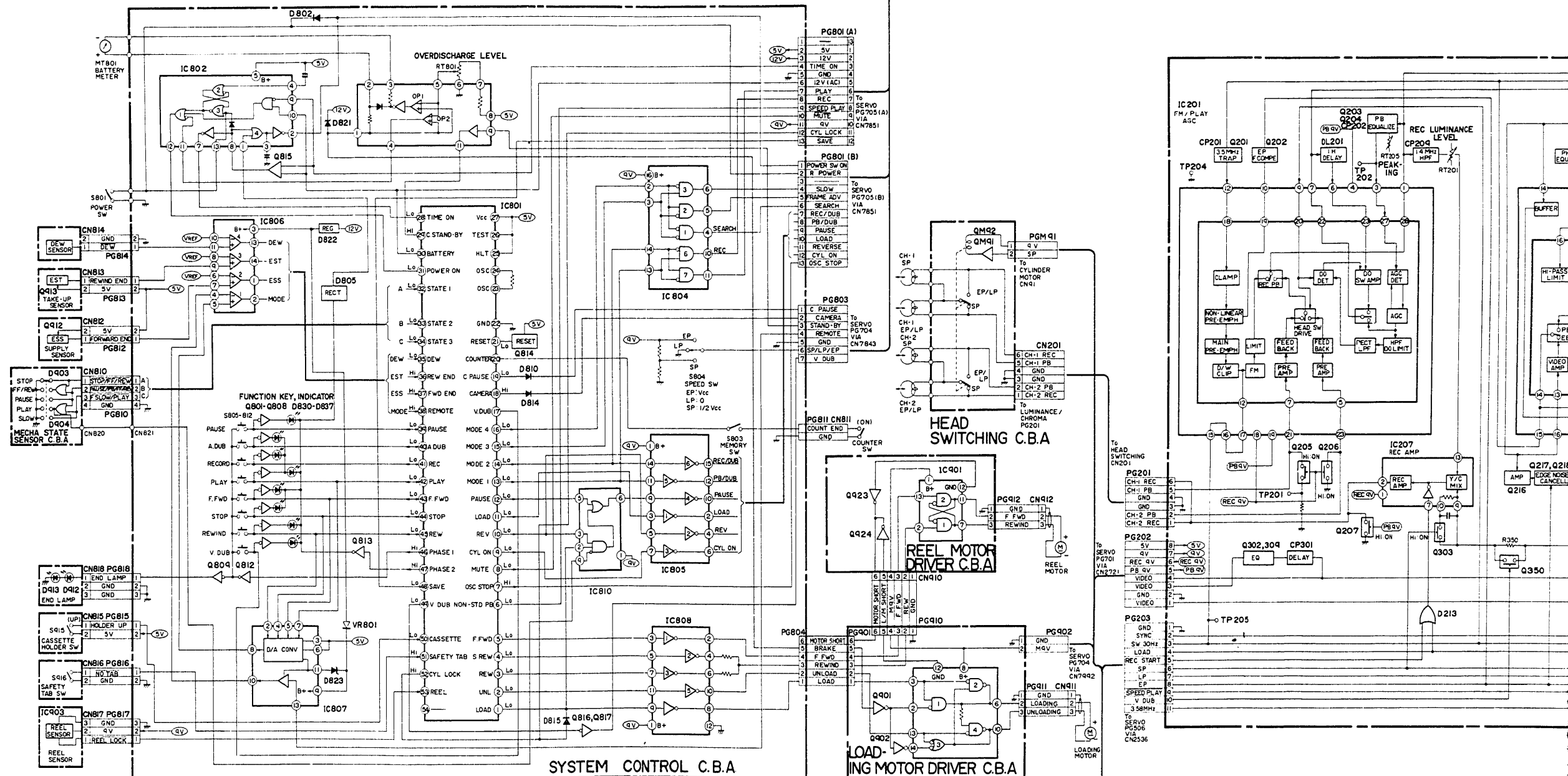
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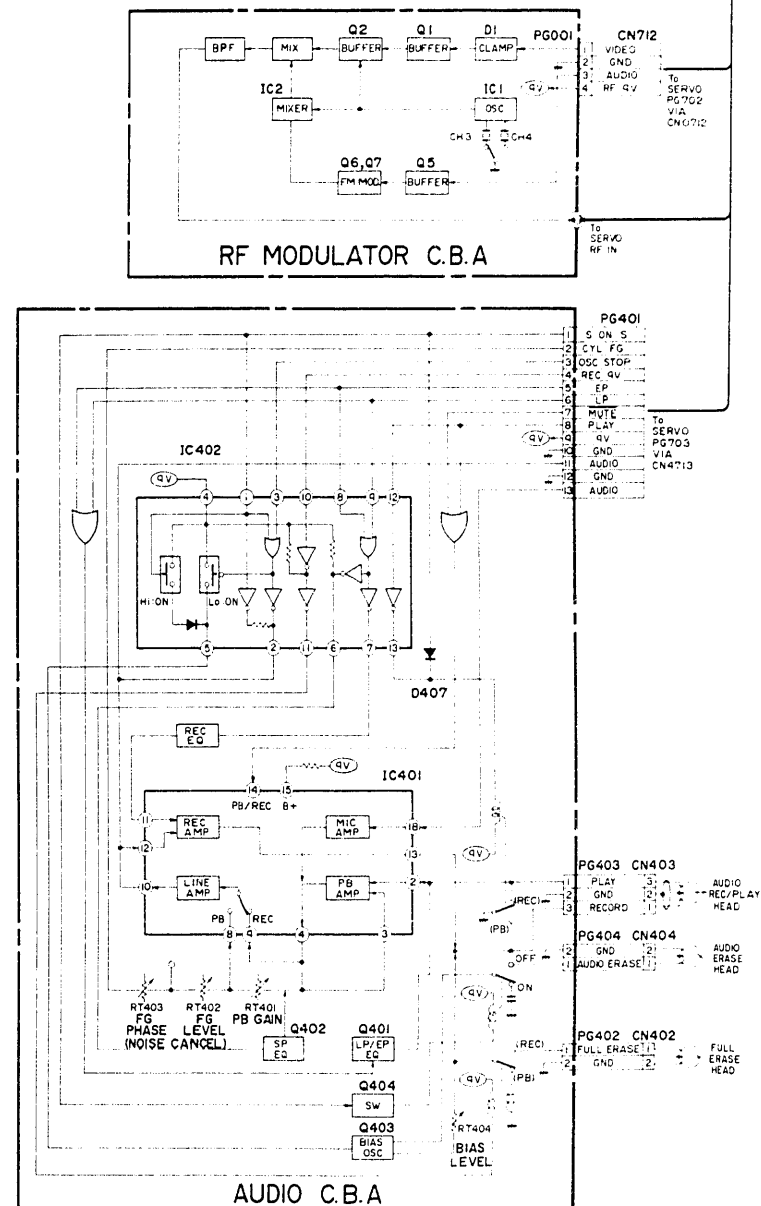
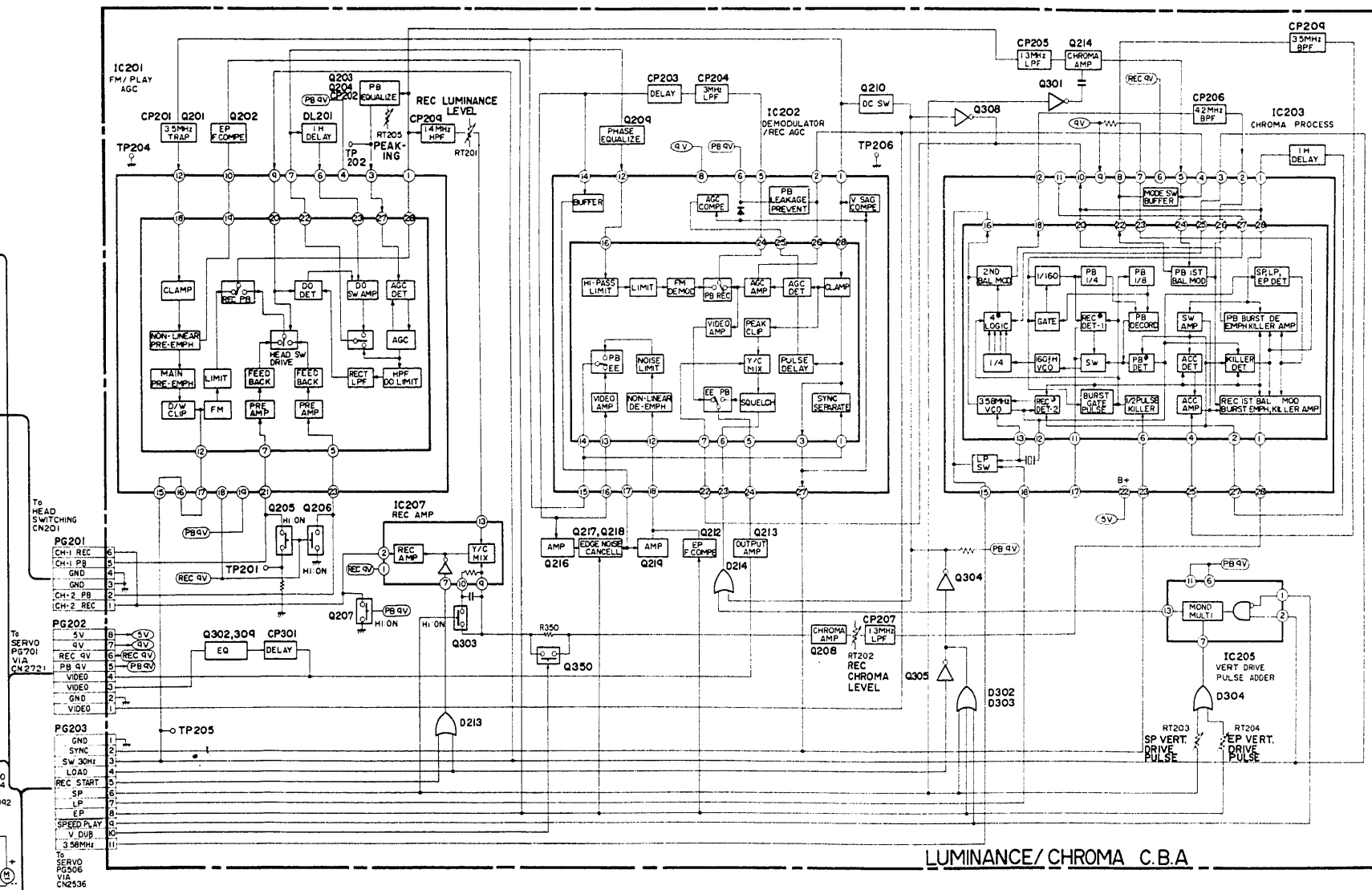
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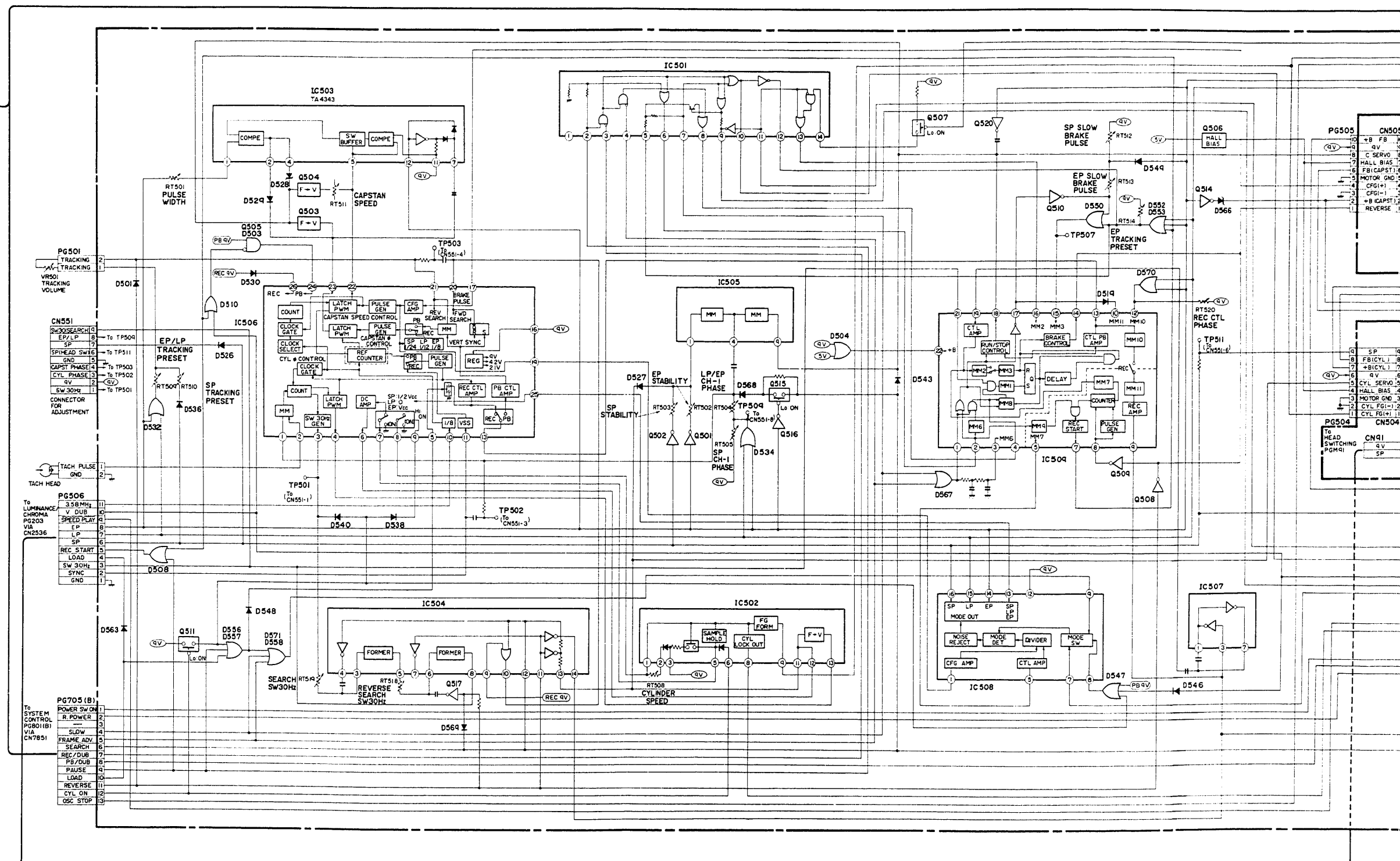
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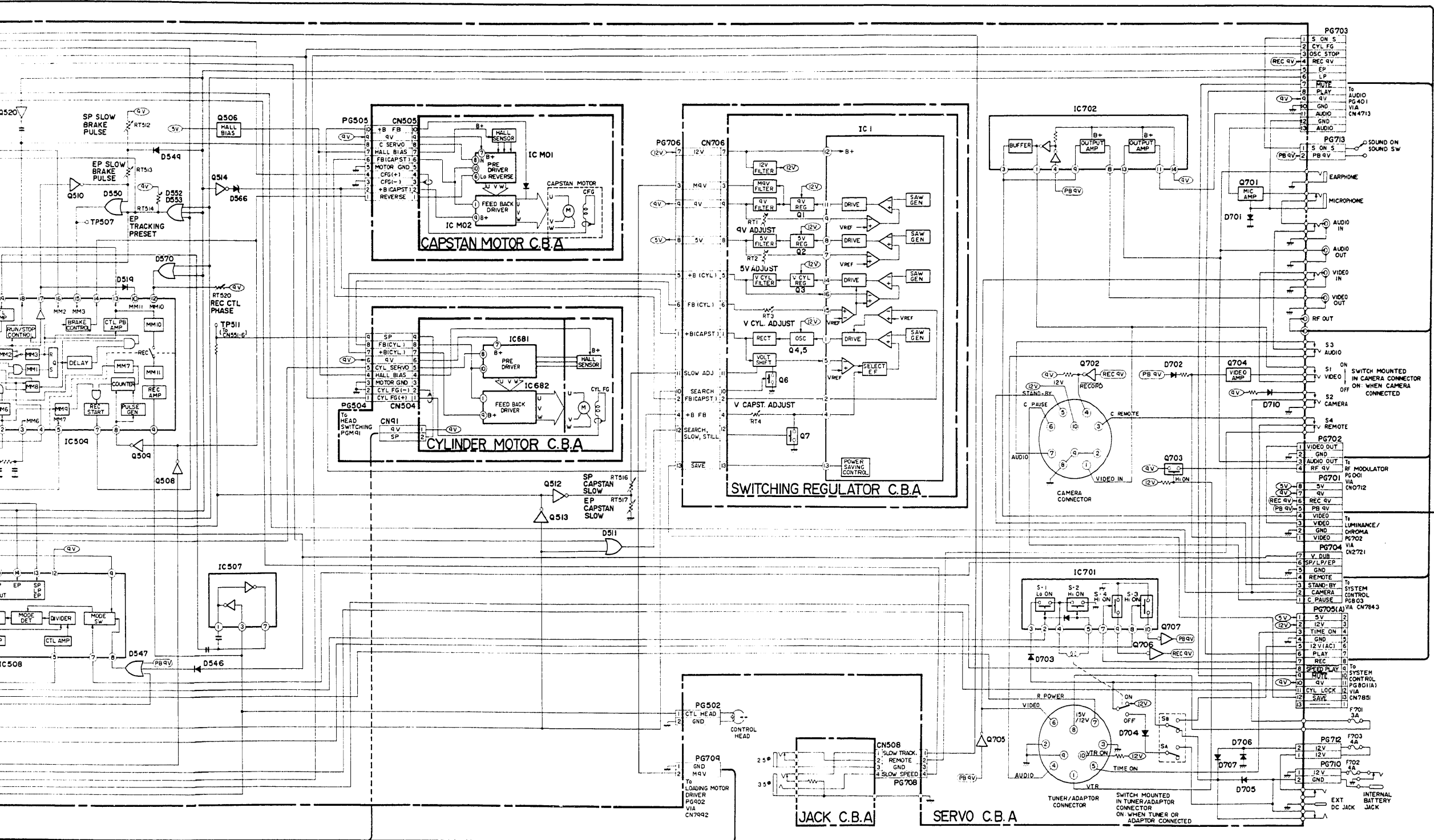
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22	23		
			
HA1406	HD44820A48		

BLOCK DIAGRAM(VT-6800A)

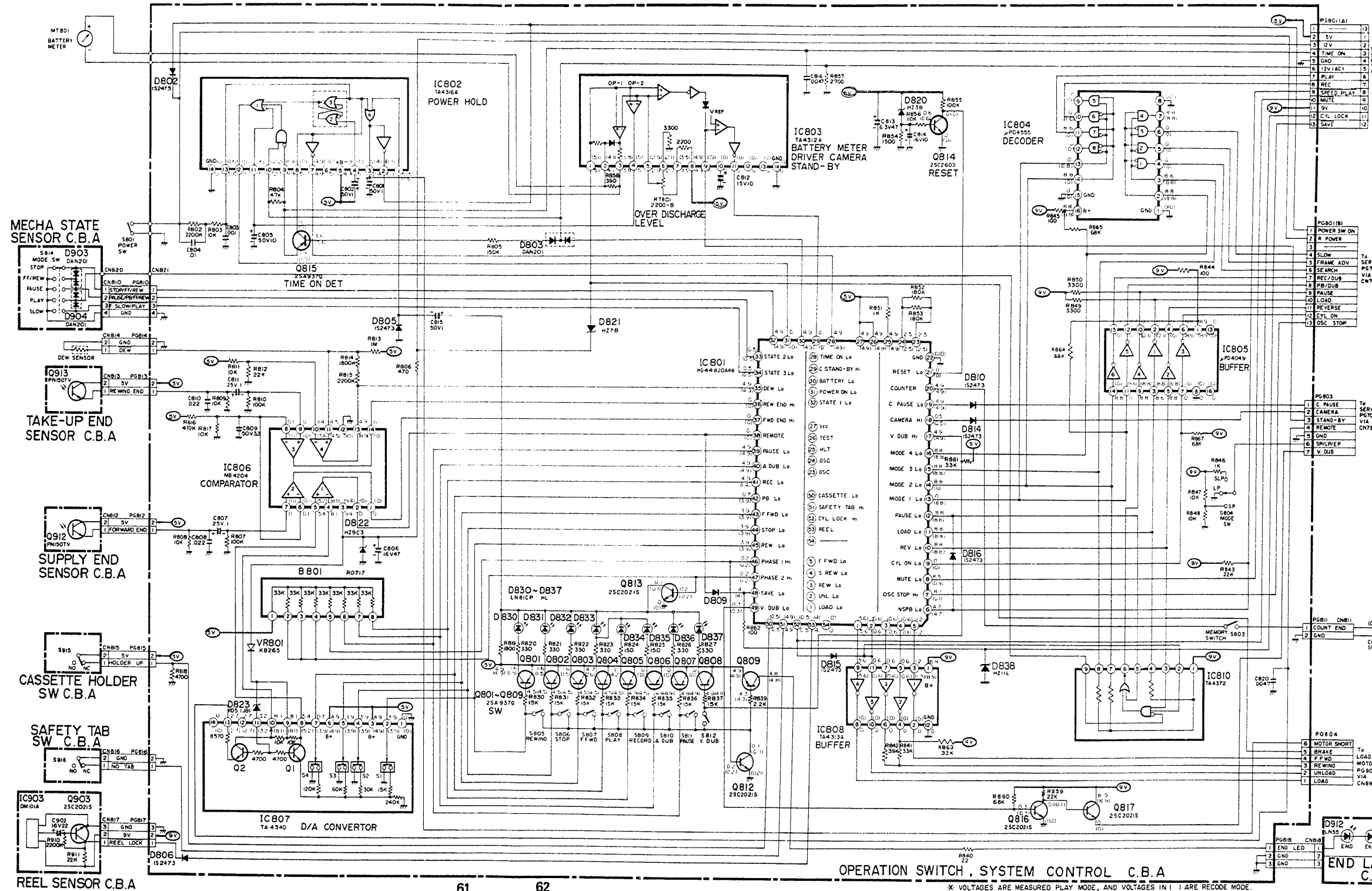


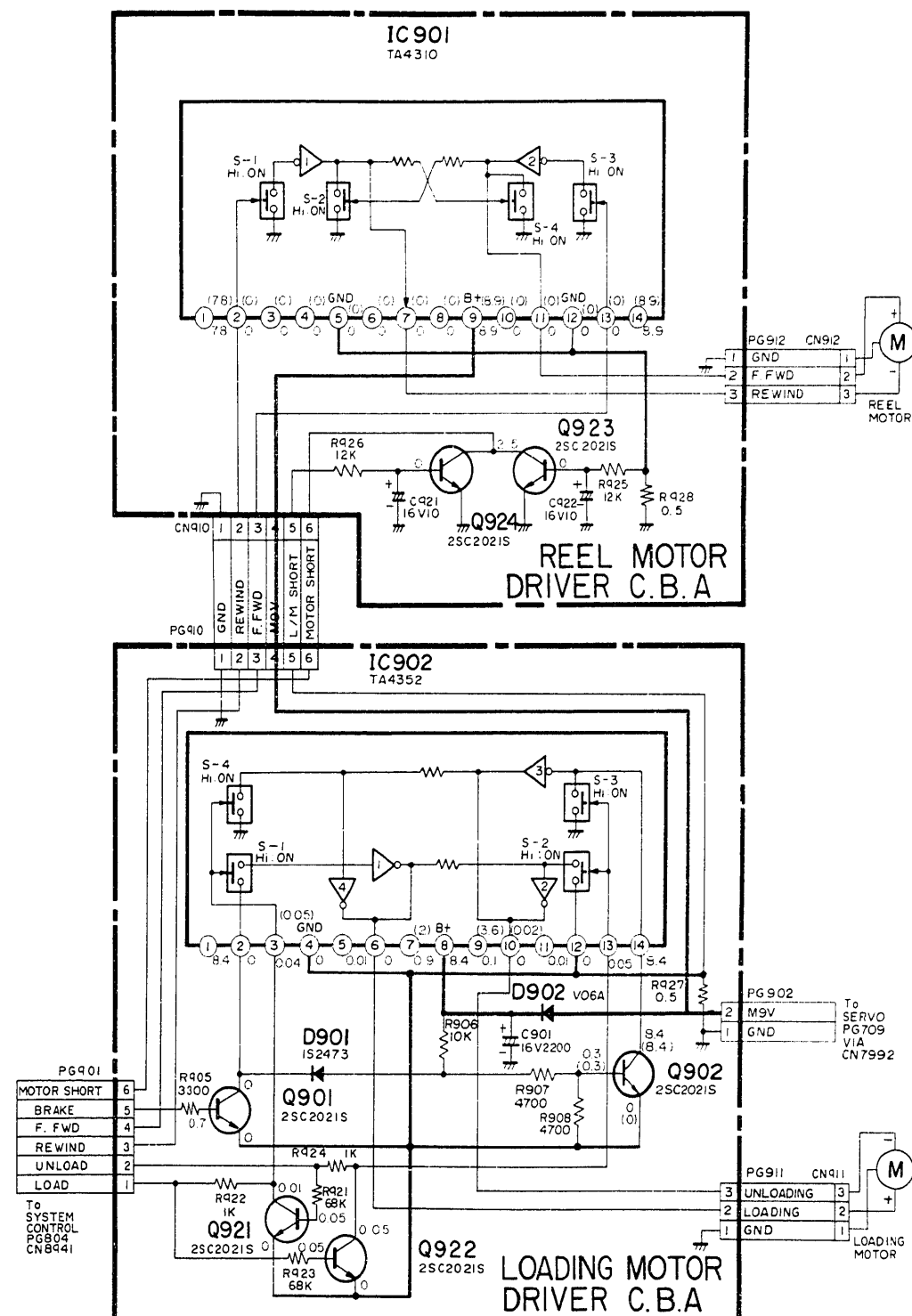
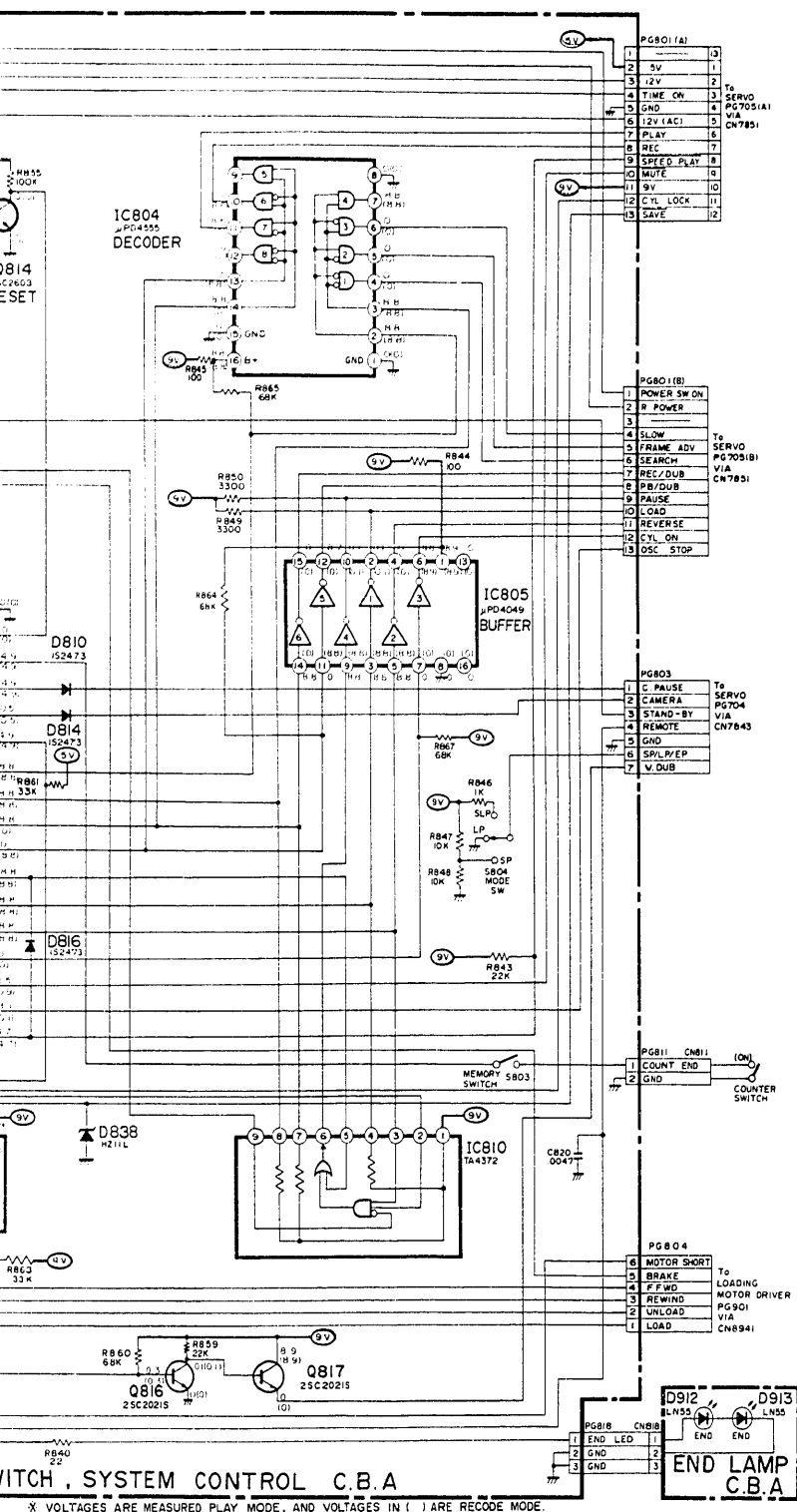




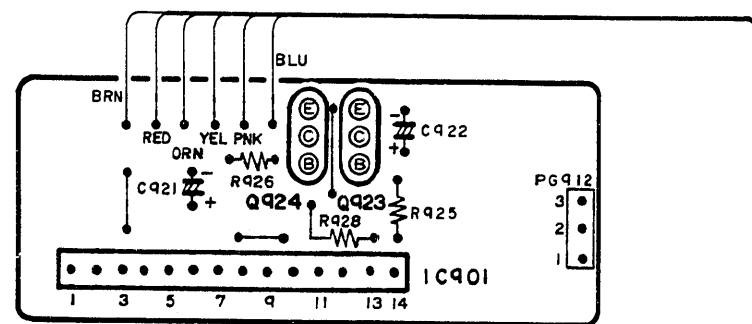


SYSTEM CONTROL (Used for the units with the serial NO. XXX02616 and later)





* VOLTAGES ARE MEASURED IN PLAY MODE, AND VOLTAGES IN () ARE RECORD MODE.



REEL MOTOR DRIVER C.B.A

IC901

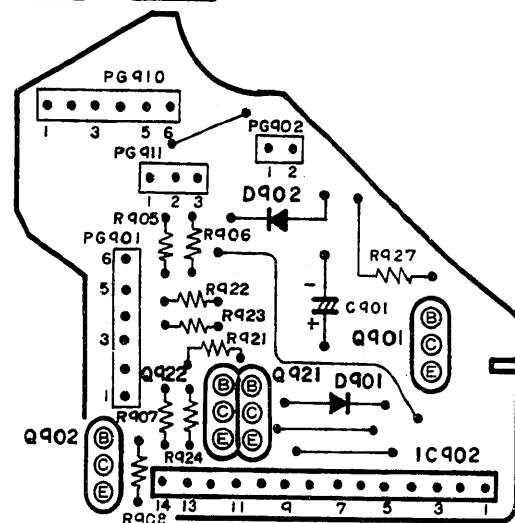
1	2	3	4	5	6	7	8	9	10	11	12	13	14
7.8 (7.8)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8.4 (8.4)	0 (0)	0 (0)	0 (0)	0 (0)	8.4 (8.4)

Q923

B	0 (0)
C	2.5 (2.5)
E	0 (0)

Q924

B	0 (0)
C	2.5 (2.5)
E	0 (0)



LOADING MOTOR DRIVER C.B.A

IC902

14	13	12	11	10	9	8	7	6	5	4	3	2	1
8.4 (8.4)	0.05 (0.05)	0 (0)	0.01 (0.01)	0 (0.02)	0.1 (3.6)	8.4 (8.4)	0.9 (2.0)	0 (0)	0.01 (0.01)	0 (0)	0.04 (0.05)	0 (0)	8.4 (8.4)

Q901

B	0.7 (0.7)
C	0 (0)
E	0 (0)

Q902

B	0.3 (0.05)
C	8.4 (8.4)
E	0 (0)

Q921

B	0.05 (0.05)
C	0.01 (0.05)
E	0 (0)

Q922

B	0.05 (0.05)
C	0.05 (0.06)
E	0 (0)

CN910

6	MOTOR SHORT
5	L/M SHORT
4	MAV
3	FFWD
2	REWIND
1	GND

To
LOADING MOTOR DRIVER
PG910

PG912

3	REWIND
2	FFWD
1	GND

To
REEL MOTOR
CN912

PG901

6	MOTOR SHORT
5	BRAKE
4	FFWD
3	REWIND
2	UNLOAD
1	LOAD

To
SYSTEM CONTROL
PG804
VIA
CN894!

PG902

2	MAV
1	GND

To
SERVO
PG709
VIA
CN7992

PG910

6	MOTOR SHORT
5	L/M SHORT
4	MAV
3	FFWD
2	REW
1	GND

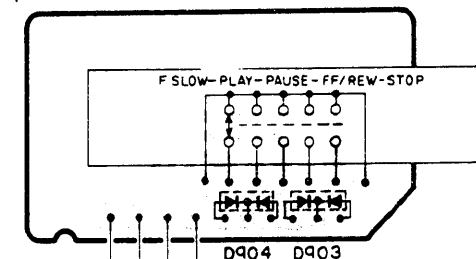
To
REEL MOTOR DRIVER
CN910

PG911

3	UNLOADING
2	LOADING
1	GND

To
LOADING MOTOR
CN911

MECHA STATE SENSOR SW C.B.A
(Used for the units with the serial No. XXX02615 and before)

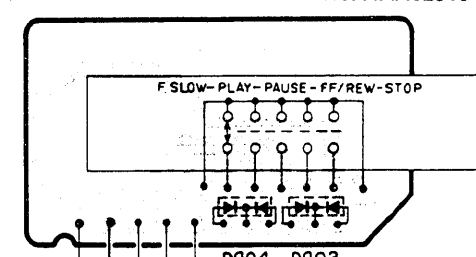


CN810

1	STOP/FF/REW
2	PAUSE/PB/FF/REW
3	FF SLOW/PLAY
4	GND

To
SYSTEM CONTROL
PG810

MECHA STATE SENSOR SW C.B.A
(Used for the units with the serial No. XXX02616 and later)



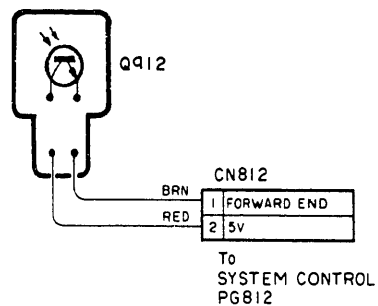
CN820
To
SYSTEM CONTROL
CN821

CN810

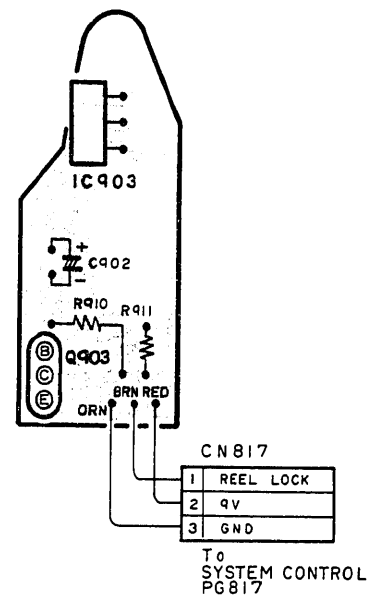
1	STOP/FF/REW
2	PAUSE/PB/FF/REW
3	FF SLOW/PLAY
4	GND

To
SYSTEM CONTROL
PG810

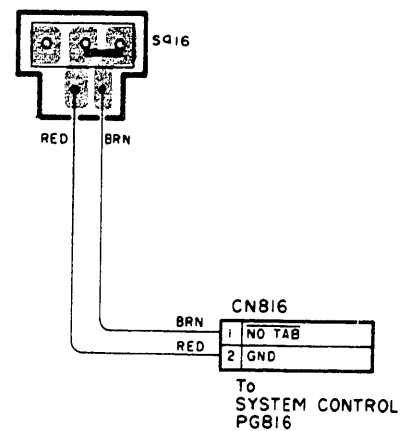
SUPPLY END SENSOR C.B.A



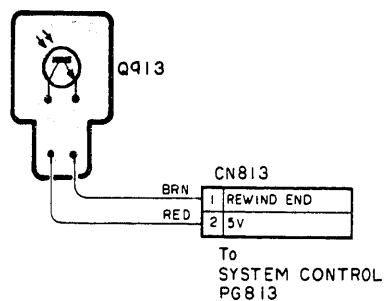
REEL SENSOR C.B.A



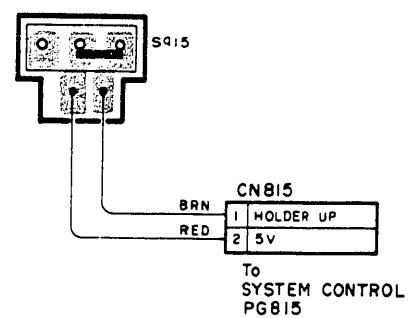
SAFETY TAB SW C.B.A



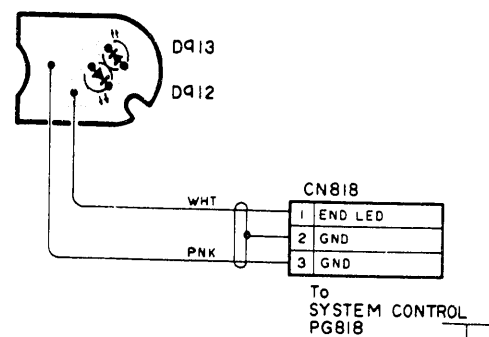
TAKE-UP END SENSOR C.B.A



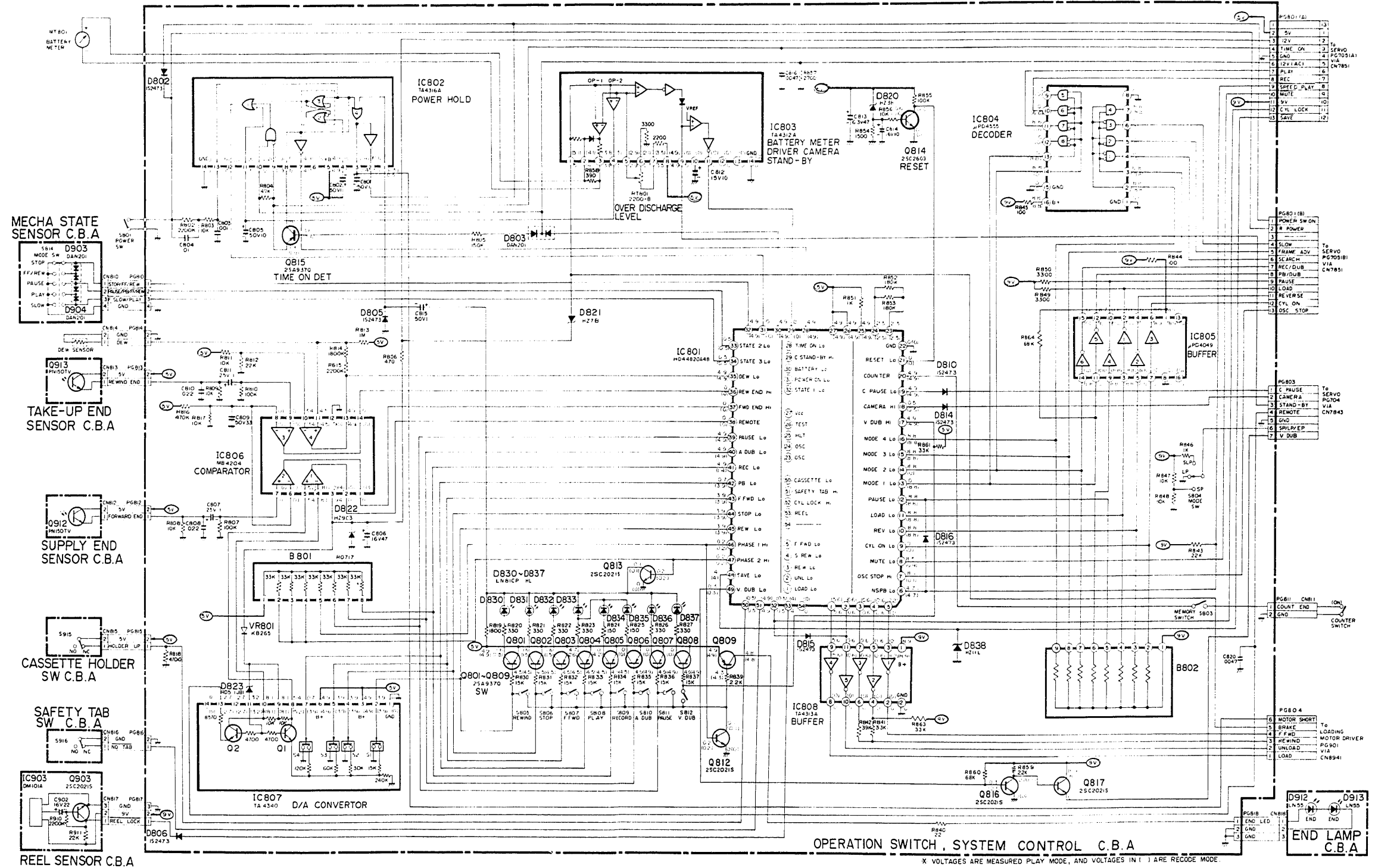
CASSETTE HOLDER SW C.B.A



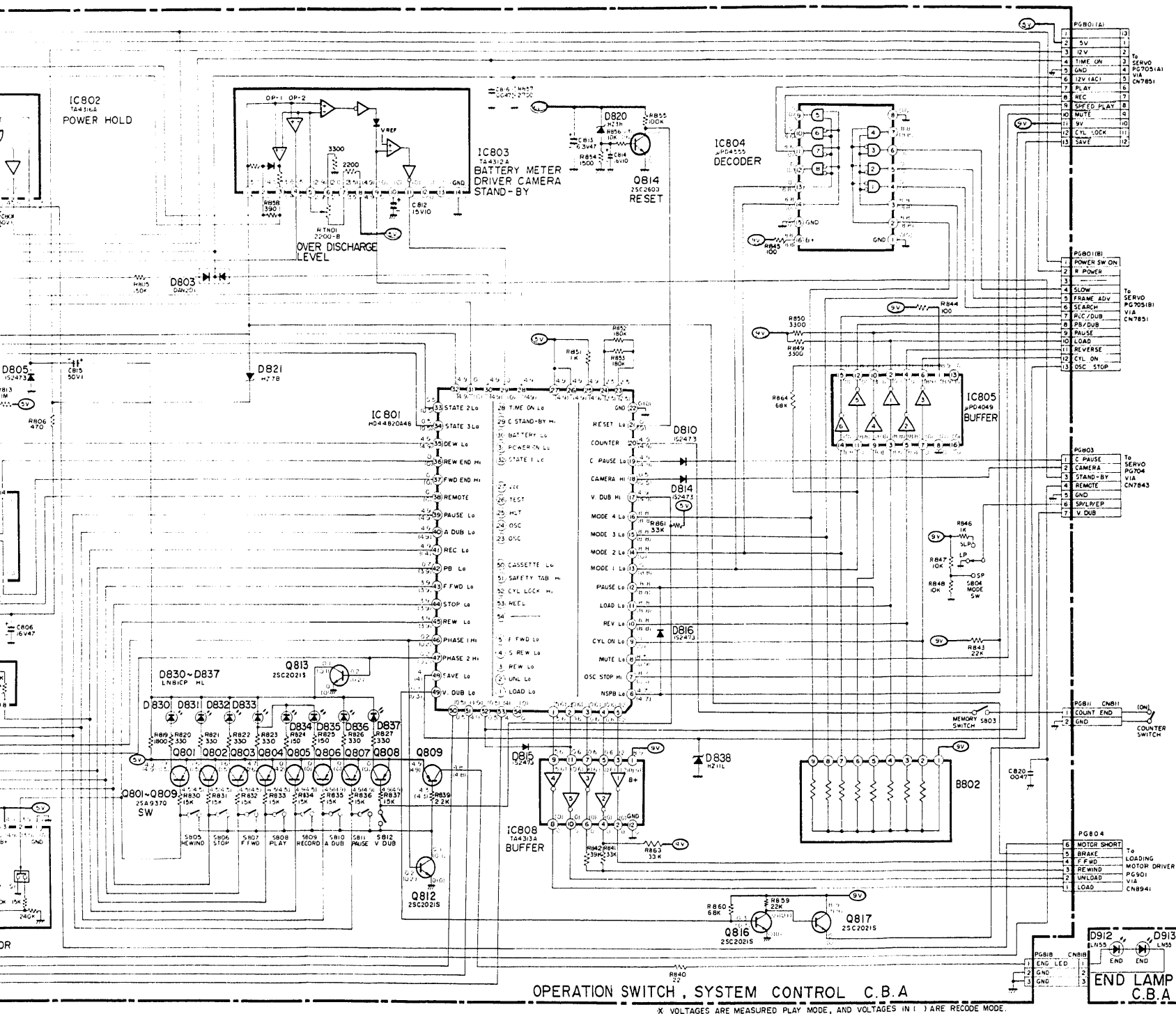
END LAMP C.B.A



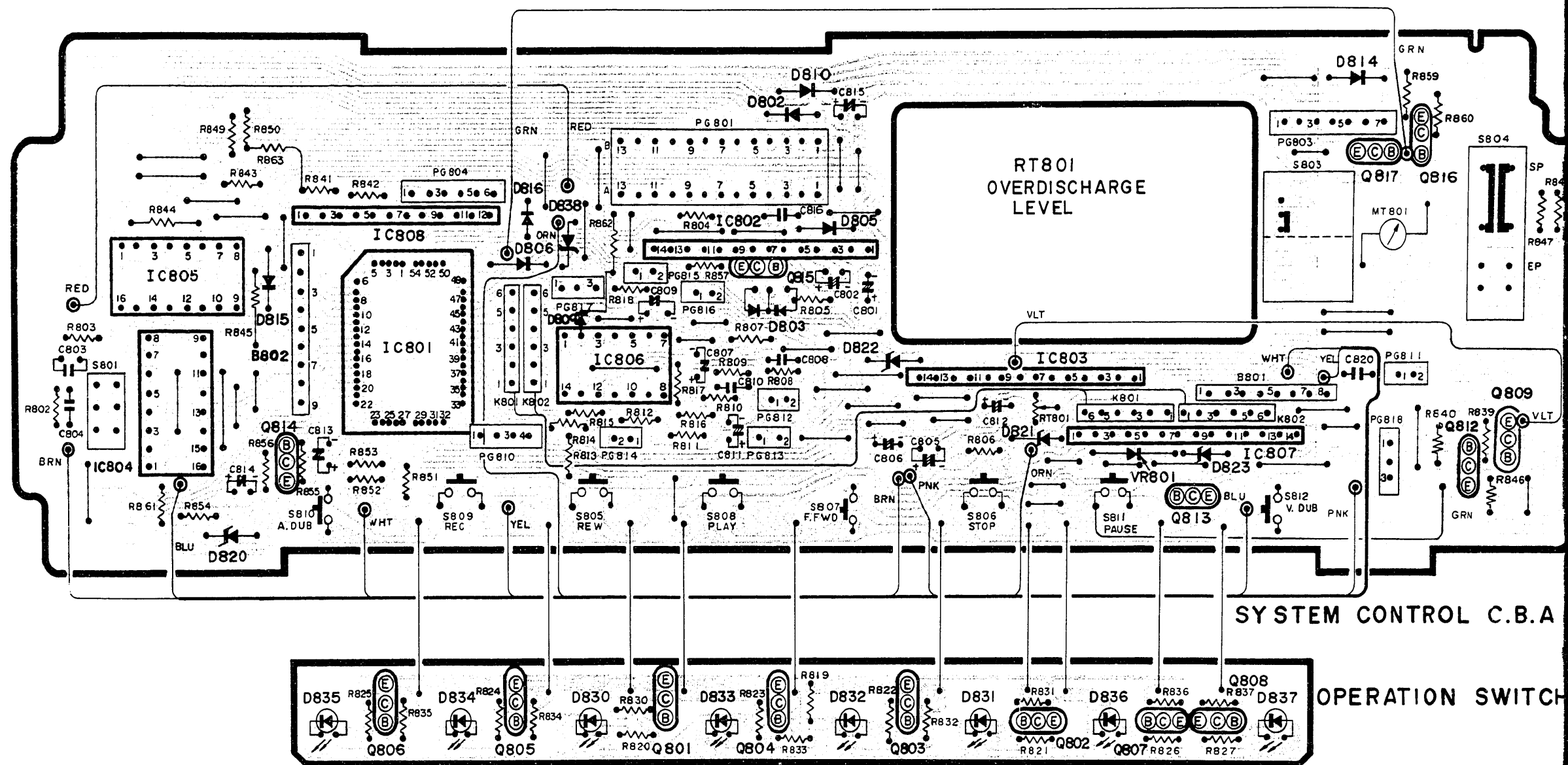
SYSTEM CONTROL (Used for the units with the serial No. XXX02615 and before)



X02615 and before)



(Used for the units with the serial No. XXX02615 and before)



PG 811
1 COUNT END
2 GND
To
TAPE
COUNTER
CN811

PG 812
2 5V
1 FORWARD END
To
SUPPLY END
SENSOR
CN812

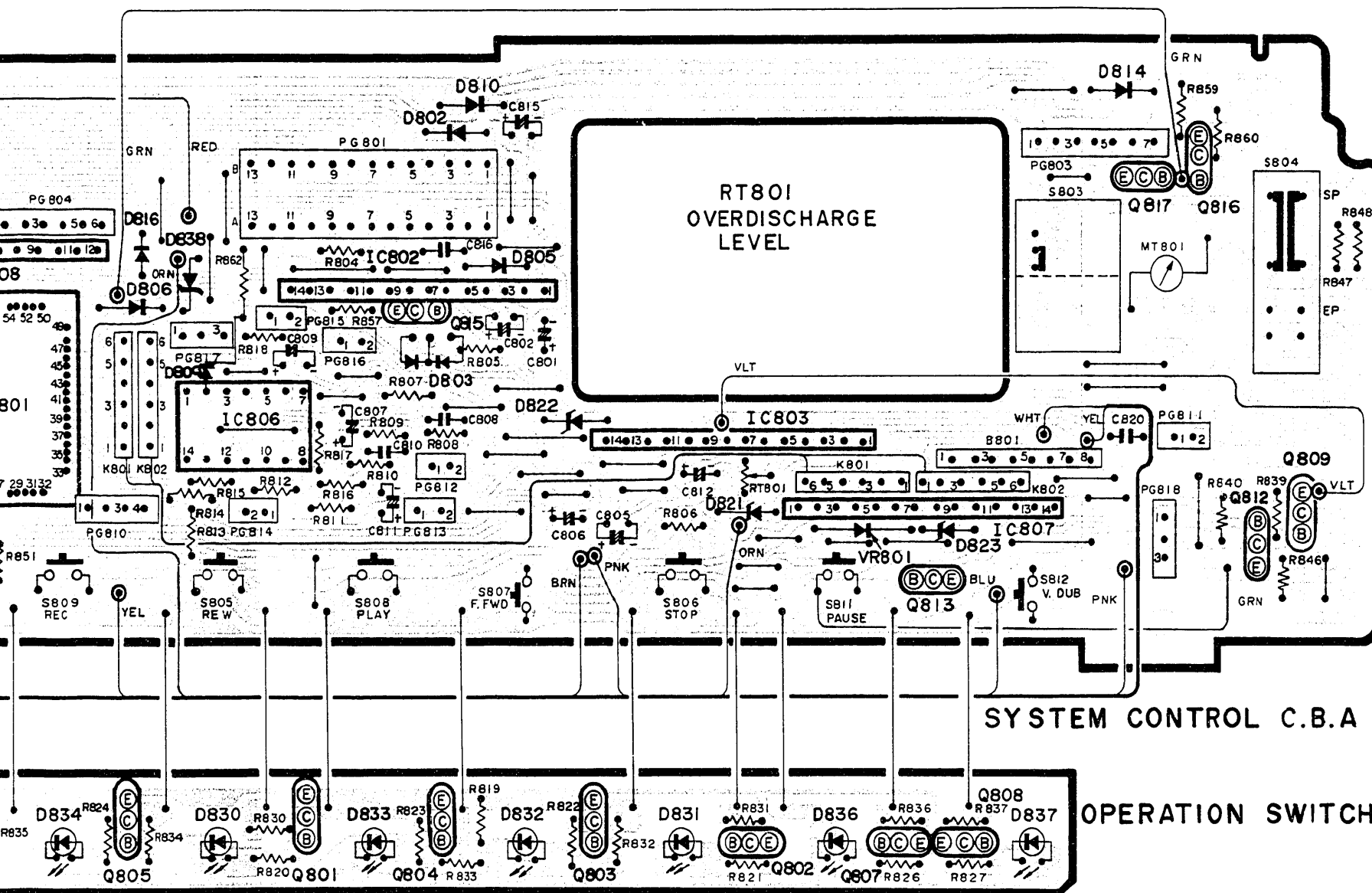
PG 813
2 5V
1 REWIND
To
TAKE-UP END
SENSOR
CN813

PG 814
2 GND
1 DEW
To
DEW
SENSOR
CN814

PG 815
2 5V
1 HOLDER UP
To
CASSETTE
HOLDER
SWITCH
CN815

PG 816
2 GND
1 NO TAB
To
SAFETY TAB
SWITCH
CN816

PG 817
3 GND
2 4V
1 REEL L
To
REEL
SENSOR
CN817



PG801(A)

1	---	13
2	5V	1
3	12V	2
4	TIME ON	3
5	GND	4
6	AC12V	5
7	PLAY	6
8	REC	7
9	SPEED PLAY	8
10	MUTE	9
11	9V	10
12	CYL LOCK	11
13	SAVE	12

To
SERVO
PG705(A)
VIA
CN7851

PG801(B)

1	POWER SW ON
2	UNLOAD
3	---
4	SLOW
5	FRAME ADV
6	SEARCH
7	REC/DUB
8	PB DUB
9	PAUSE
10	LOAD
11	REVERSE
12	CYL ON
13	OSC STOP

To
SERVO
PG705(B)
VIA
CN7851

PG803

1	C. PAUSE
2	CAMERA
3	STAND-BY
4	REMOTE
5	GND
6	SP/LP/EP
7	V. DUB

To
SERVO
PG704
VIA
CN7843

PG804

6	MOTOR SHORT
5	BRAKE
4	F. FWD
3	REWIND
2	UNLOAD
1	LOAD

To
LOADING
MOTOR
DRIVER
PG901
VIA
CN8941

PG810

1	STOP/FF/REW
2	PAUSE/PB/FF/REW
3	F. SLOW/PLAY
4	GND

To
MECHA
STATE
SENSOR
CN810

SYSTEM CONTROL C.B.A.

OPERATION SWITCH C.B.A.

PG 811

1	COUNT END
2	GND

To
TAPE
COUNTER
CN811

PG 812

2	5V
1	FORWARD END

To
SUPPLY END
SENSOR
CN812

PG 813

2	5V
1	REWIND

To
TAKE-UP END
SENSOR
CN813

PG 814

2	GND
1	DEW

To
DEW
SENSOR
CN814

PG 815

2	5V
1	HOLDER UP

To
CASSETTE
HOLDER
SWITCH
CN815

PG 816

2	GND
1	NO TAB

To
SAFETY TAB
SWITCH
CN816

PG 817

3	GND
2	4V
1	REEL LOCK

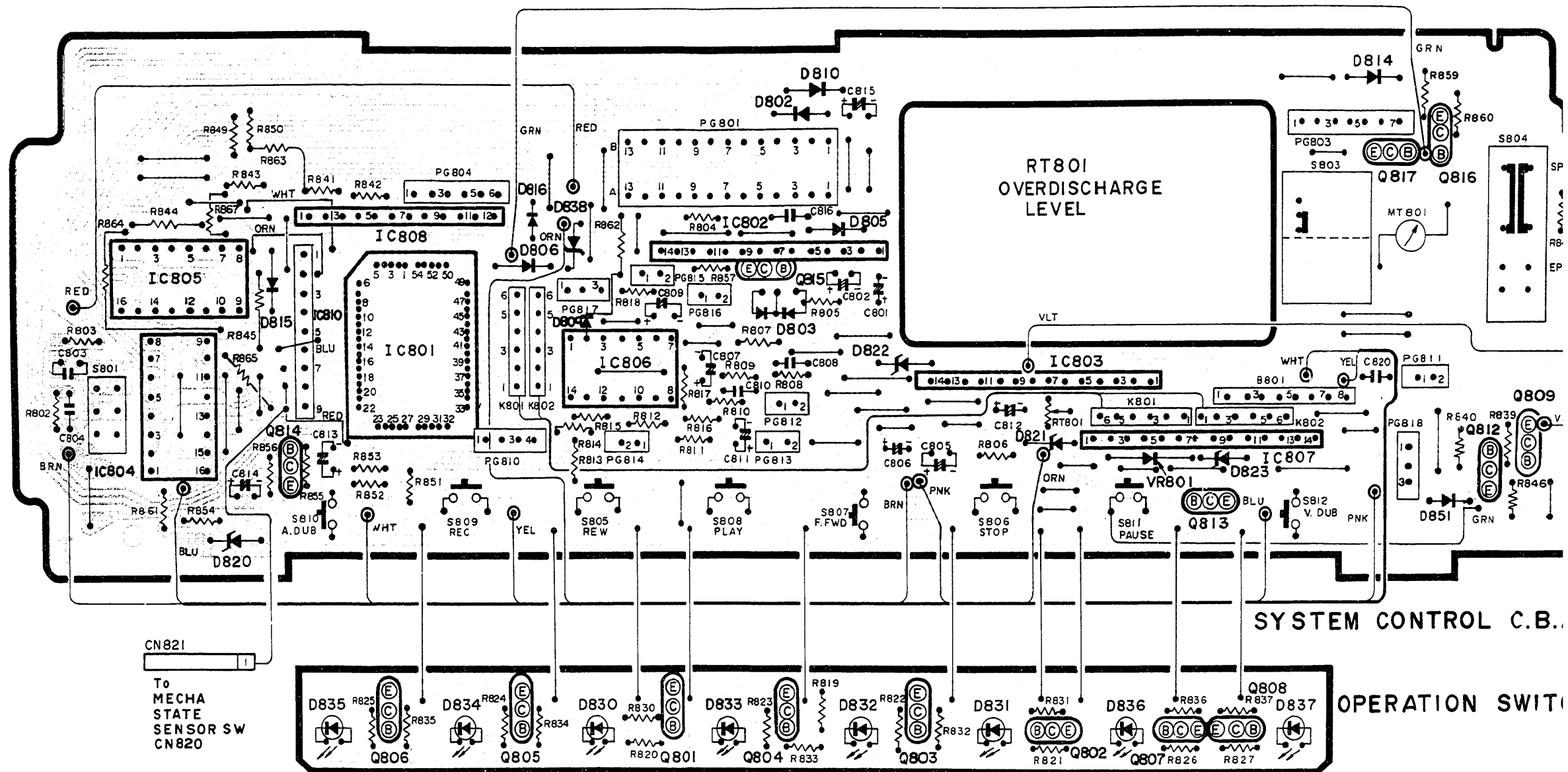
To
REEL
SENSOR
CN817

PG 818

1	END LED
2	GND
3	GND

To
END LAMP
CN818

(Used for the units with the Serial No. XXX02616 and later)



PG 811	
1	COUNT END
2	GND

To
TAPE
COUNTER
CN811

PG 812	
2	5V
1	FORWARD END

To
SUPPLY END
SENSOR
CN812

PG 813	
2	5V
1	REWIND

To
TAKE-UP END
SENSOR
CN813

PG 814	
2	GND
1	DEW

To
DEW
SENSOR
CN814

PG 815	
2	5V
1	HOLDER UP

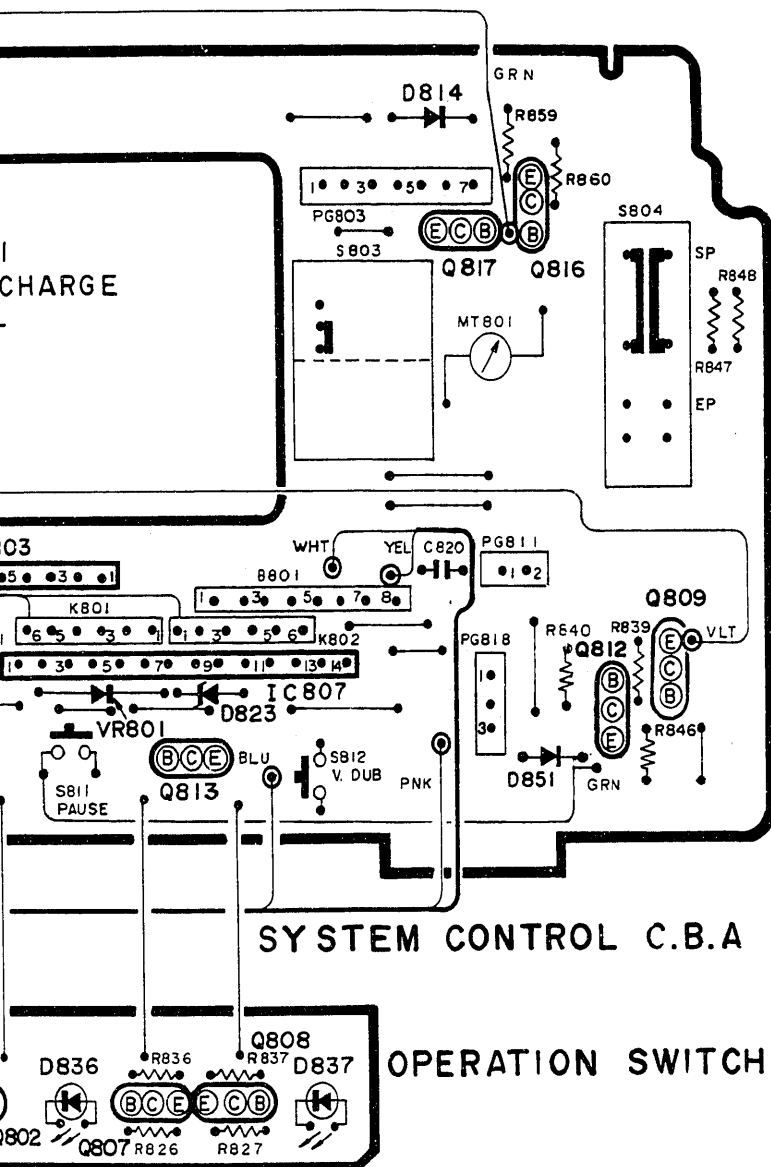
To
CASSETTE
HOLDER
SWITCH
CN815

PG 816	
2	GND
1	NO TAB

To
SAFETY TAB
SWITCH
CN816

PG 817	
3	GND
2	4V
1	REEL

To
REEL
SENS
CN817



PG801(A)

1	---	13
2	5V	1
3	12V	2
4	TIME ON	3
5	GND	4
6	AC12V	5
7	PLAY	6
8	REC	7
9	SPEED PLAY	8
10	MUTE	9
11	9V	10
12	CYL LOCK	11
13	SAVE	12

To
SERVO
PG705(A)
VIA
CN7851

PG803

1	C. PAUSE
2	CAMERA
3	STAND-BY
4	REMOTE
5	GND
6	SP/LP/EP
7	V. DUB

To
SERVO
PG704
VIA
CN7843

PG801(B)

1	POWER SW ON
2	UNLOAD
3	---
4	SLOW
5	FRAME ADV.
6	SEARCH
7	REC/DUB
8	PB DUB
9	PAUSE
10	LOAD
11	REVERSE
12	CYL ON
13	OSC STOP

To
SERVO
PG705(B)
VIA
CN7851

PG804

6	MOTOR SHORT
5	BRAKE
4	F. FWD
3	REWIND
2	UNLOAD
1	LOAD

To
LOADING
MOTOR
DRIVER
PG901
VIA
CN8941

PG810

1	STOP/FF/REW
2	PAUSE/PB/FF/REW
3	F. SLOW/PLAY
4	GND

To
MECHA
STATE
SENSOR
CN810

IC801

1	5.6(5.6)	11	8.8(8.8)	21	0(0)	31	0(0)	41	4.9(4.9)	51	4.9(4.9)
2	0.6(0.6)	12	8.8(8.8)	22	0(0)	32	4.9(4.9)	42	0.7(3.9)	52	0.5(0.5)
3	0.6(0.6)	13	0(8.8)	23	2.5(2.5)	33	0.5(0.5)	43	3.9(3.9)	53	4.0(4.0)
4	0.6(0.6)	14	8.8(0)	24	2.5(2.5)	34	0.5(0.5)	44	3.9(3.9)	54	0(0)
5	1.2(1.2)	15	8.8(8.8)	25	4.9(4.9)	35	4.9(4.9)	45	3.9(3.9)		
6	4.7(4.7)	16	8.8(8.8)	26	4.9(4.9)	36	0(0)	46	0.2(0.2)		
7	8.1(0.1)	17	4.9(4.9)	27	4.9(4.9)	37	0(0)	47	0.2(0.2)		
8	8.5(0.9)	18	0.5(0.5)	28	4.9(4.9)	38	0(0)	48	4.0(4.0)		
9	0(0)	19	4.9(4.9)	29	0(0)	39	4.9(4.9)	49	0.2(0.2)		
10	8.8(8.8)	20	4.9(4.9)	30	4.9(4.9)	40	4.9(4.9)	50	0.5(0.5)		

IC802

14	13	12	11	10	9	8	7	6	5	4	3	2	1
0(0)	0.6(0.6)	0(0)	5.0(5.0)	12.1(12.1)	11.9(11.9)	0(0)	4.9(4.9)		4.9(4.9)	0(0)	2.4(2.4)	0.1(0.1)	0.5(0.5)

IC803

14	13	12	11	10	9	8	7	6	5	4	3	2	1
0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	4.9(4.9)	3.5(3.5)	2.1(2.1)	2.9(2.9)	5.0(5.0)	3.8(3.8)	4.1(4.1)	5.1(5.1)

IC804

9	10	11	12	13	14	15	16
0(0)	0(8.6)	8.6(0)	0(0)	0(8.8)	8.8(0)	0(0)	8.8(8.8)
8	7	6	5	4	3	2	1
0(0)	8.8(8.8)	0(0)	0(0)	0(0)	8.8(8.8)	8.8(8.8)	0(0)

IC805

1	2	3	4	5	6	7	8
8.9(8.9)	0.1(0.1)	8.8(8.8)	0(0)	8.8(8.8)	8.8(8.9)	0(0)	0(0)
16	15	14	13	12	11	10	9
0(0)	0(0)	8.8(0)	0(0)	8.7(0)	0(8.8)	0.1(0.1)	8.8(8.8)

IC806

1	2	3	4	5	6	7
0(0)	0(0)	9.4(9.4)	8.1(8.1)	5.4(5.2)	0.1(0.1)	0(0)
14	13	12	11	10	9	8
0(0)	4.9(4.9)	0(0)	4.5(4.5)	3.4(3.4)	0(0)	0.1(0.1)

IC807

1	2	3	4	5	6	7	8	9	10	11	12	13	14
0(0)	3.9(3.9)	4.9(4.9)	3.9(3.9)	3.9(3.9)	4.9(4.9)	0.7(3.9)	5.4(5.2)	8.1(8.1)	8.1(8.1)	3.2(3.2)	2.7(2.7)	2.7(2.7)	0(0)

IC808

1	2	3	4	5	6	7	8	9	10	11	12
8.9(8.9)	0(0)	1.2(1.2)	0(0)	0.6(0.6)	0(0)	0.6(0.6)	0(0)	0.6(0.6)	0(0)	5.6(5.6)	0(0)

Q801	Q802	Q803	Q804	Q805	Q806	Q807
B 4.5(4.5)	B 4.5(4.5)	B 4.5(4.5)	B 4.5(4.5)	B 4.9(4.5)	B 4.9(4.9)	B 4.9(4.9)
C 1.6(1.5)	C 1.6(1.5)	C 1.6(1.5)	C 4.7(2.6)	C 0(4.2)	C 0(0)	C 0(0)
E 4.9(4.9)	E 4.9(4.9)	E 4.9(4.9)	E 4.9(4.9)	E 4.9(4.9)	E 4.9(4.9)	E 4.9(4.9)

Q808	Q809	Q812	Q813	Q814	Q815	Q816
B 4.9(4.9)	B 4.3(4.3)	B 0.2(0.2)	B 0.2(0.2)	B 0.6(0.6)	B 3.6(3.6)	B 0.3(0.3)
C 0(0)	C 4.8(4.8)	C 0.1(0.1)	C 0.1(0.1)	C 0(0)	C 0(0)	C 0.1(0.1)
E 4.9(4.9)	E 4.9(4.9)	E 0(0)	E 0(0)	E 0(0)	E 11.9(11.9)	E 0(0)

Q817
B 0.1(0.1)
C 8.9(8.9)
E 0(0)

* VOLTAGES ARE MEASURED IN PLAY MODE,
AND VOLTAGES IN () ARE RECORD MODE.

SERVO

SERVO SIGNALS

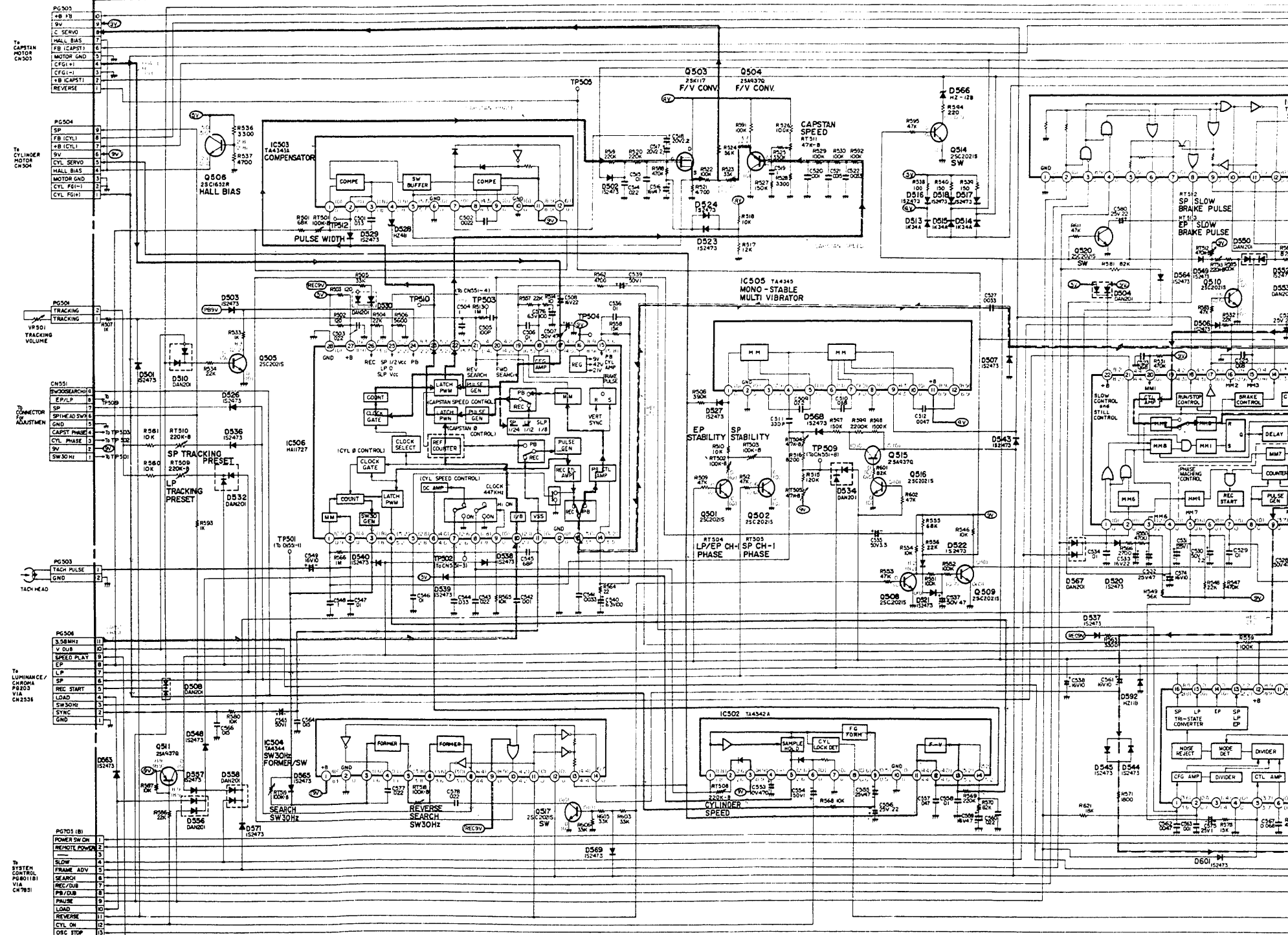
- CAPSTAN SERVO
 - REC/PB CAPSTAN SERVO
 - REC CAPSTAN SERVO
 - PB CAPSTAN SERVO
- CYLINDER SERVO
 - REC/PB CYLINDER SERVO
 - REC CYLINDER SERVO
 - PB CYLINDER SERVO

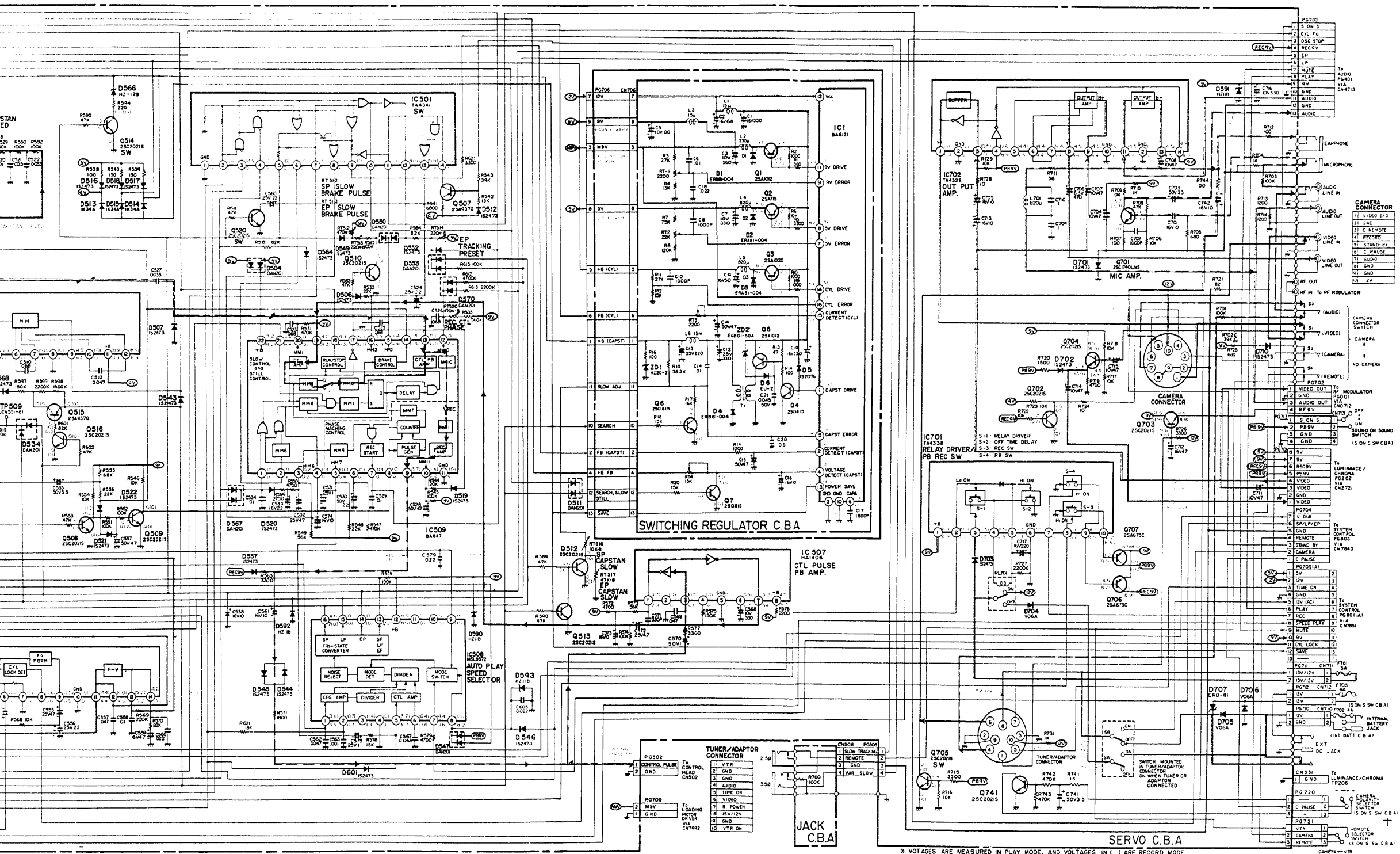
AUDIO SIGNALS

- REC AUDIO
- PB AUDIO

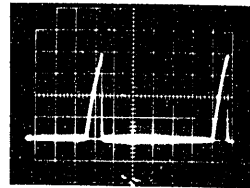
VIDEO SIGNALS

- REC VIDEO
- PB VIDEO

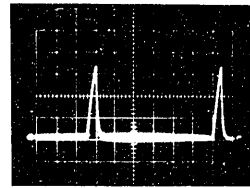




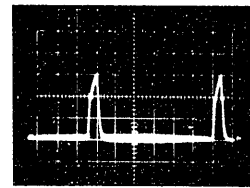
SERVO WAVEFORMS



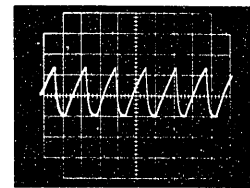
IC501-12 PLAY
1V/5msec. div.



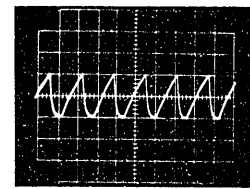
IC501-13 PLAY
1V/5msec. div.



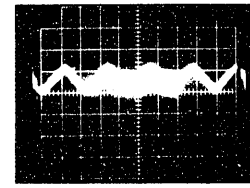
IC501-14 PLAY
0.5V/5msec. div.



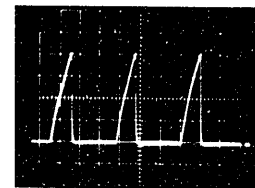
IC502-1 PLAY
1V/5msec. div.



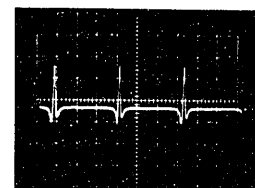
IC502-2 PLAY
1V/5msec. div.



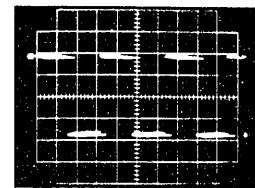
IC502-13 REC/PLAY
50mV/0.5msec. div.



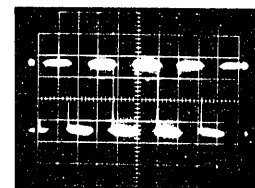
IC506-1 REC/PLAY
1V/10msec. div.



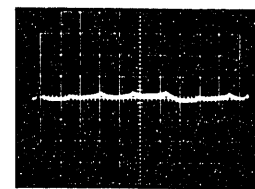
IC506-2 REC/PLAY
0.5V/10msec. div.



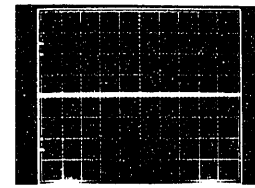
IC506-3 REC/PLAY
1V/10msec. div.



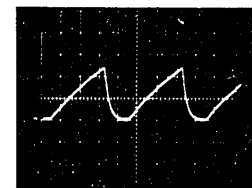
IC506-4 REC/PLAY
2V/0.5msec. div.



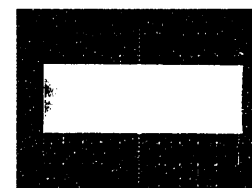
IC506-6 REC/PLAY
0.2V/5msec. div.



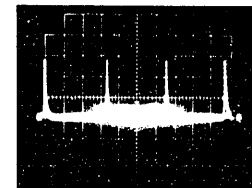
IC506-7 REC/PLAY
0.1V/5msec. div.



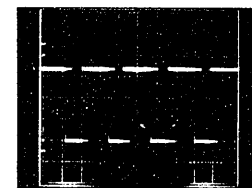
IC506-8 REC/PLAY
1V/2msec. div.



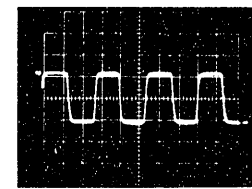
IC506-10 REC/PLAY
0.1V/0.5msec. div.



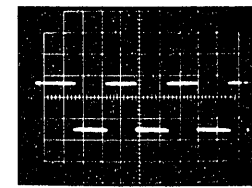
IC506-11 REC/PLAY
0.5V/5msec. div.



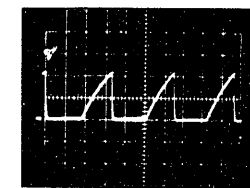
IC506-13 REC
2V/10msec. div.



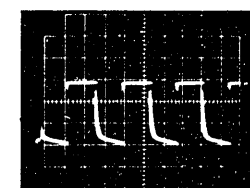
IC506-19 REC/PLAY
1V/0.5msec. div.



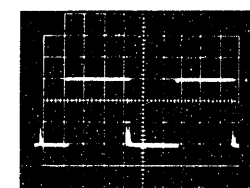
IC506-20 REC
0.5V/10msec. div.



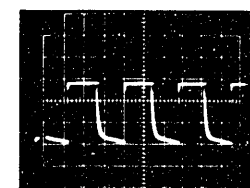
IC506-21 REC/PLAY
2V/10msec. div.



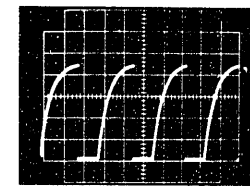
IC506-22 REC/PLAY
2V/0.1msec. div.



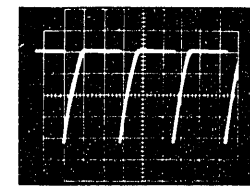
IC506-23 REC/PLAY
2V/0.1msec. div.



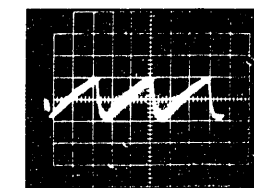
IC503-8 PLAY
2V/0.1msec. div.



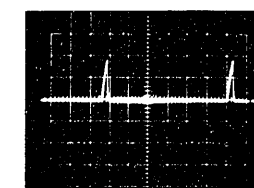
IC503-8 PLAY
2V/0.1msec. div.



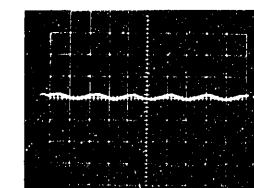
IC503-9 PLAY
2V/0.1msec. div.



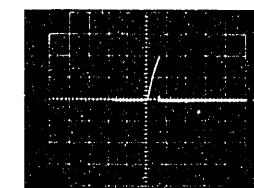
IC509-4 SLOW
2V/100msec. div.



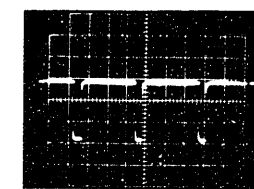
IC509-5 PLAY
2V/5msec. div.



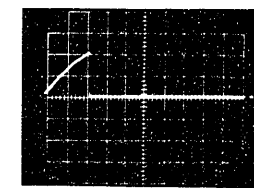
IC509-9 SLOW
1V/10msec. div.



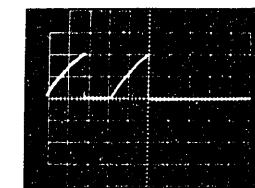
IC509-10 SLOW
2V/50msec. div.



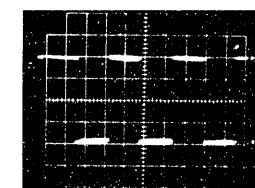
IC509-13 PLAY
0.05V/10msec. div.



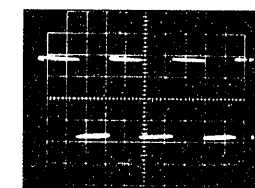
IC509-15 SLOW
2V/10msec. div.



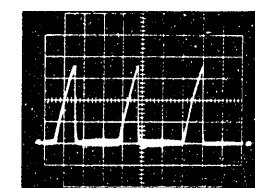
IC509-20 SLOW
2V/10msec. div.



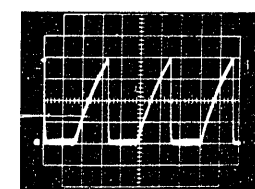
IC509-21 PLAY
2V/10msec. div.



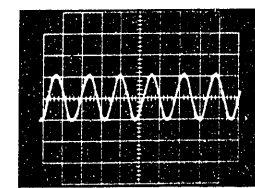
TP501 REC/PLAY
1V/10msec. div.



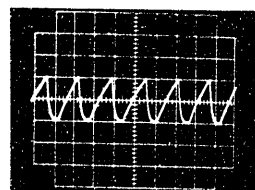
TP502 REC/PLAY
1V/10msec. div.



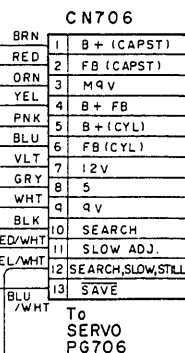
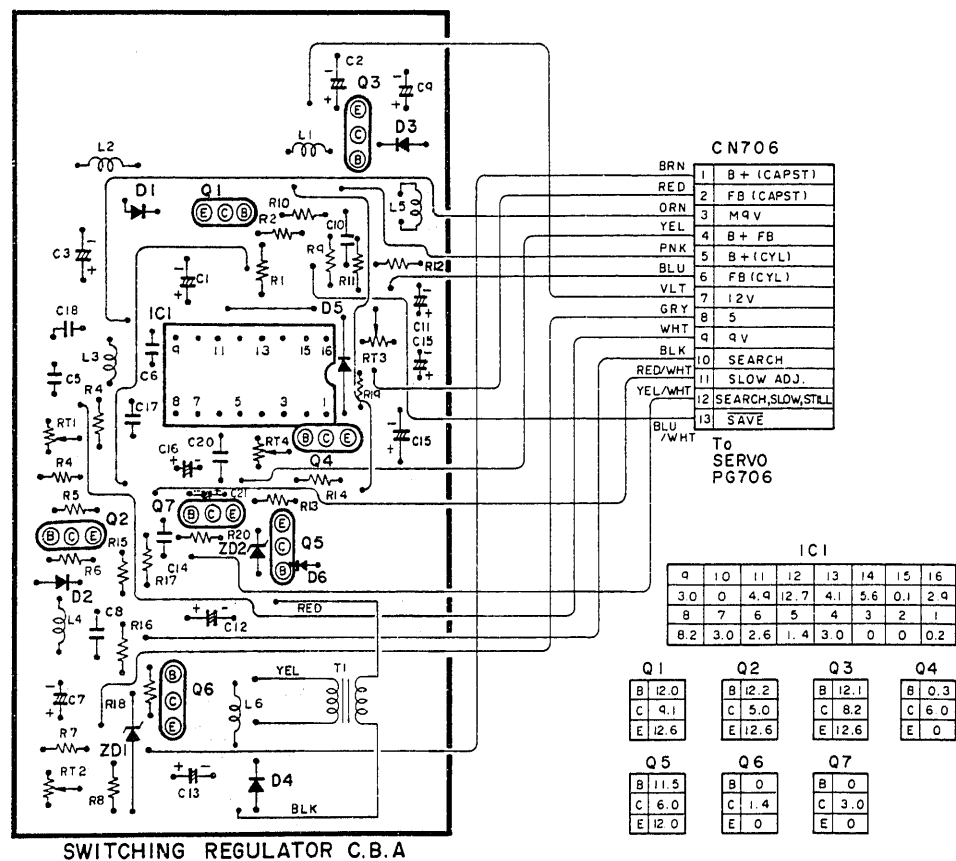
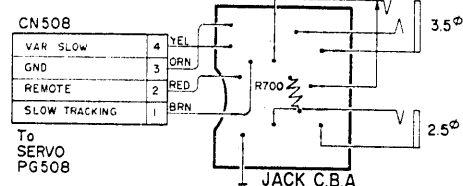
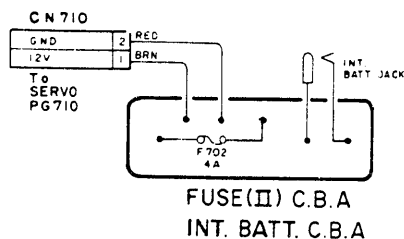
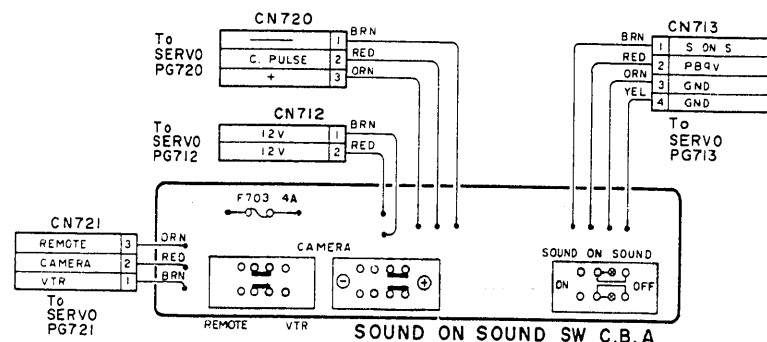
TP503 REC/PLAY
1V/10msec. div.



TP509 REC/PLAY
1V/10msec. div.



PG504:1 REC.PLAY
1V/5msec. div.



Q	10	11	12	13	14	15	16
3.0	0	4.9	12.7	4.1	5.6	0.1	2.9
8	7	6	5	4	3	2	1
8.2	3.0	2.6	1.4	3.0	0	0	0.2

Q1	Q2	Q3	Q4
B 12.0	B 12.2	B 12.1	B 0.3
C 9.1	C 5.0	C 8.2	C 6.0
E 12.6	E 12.6	E 12.6	E 0

Q5	Q6	Q7
B 11.5	B 0	B 0
C 6.0	C 1.4	C 3.0
E 12.0	E 0	E 0

1	2	3	4	5	6	7	8	9	10	11	12	13	14
0(0)	0(0)	0(8.9)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(7(0.9))	0(9(0.9))	6.3(6.3)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.8(1.8)	2.6(2.6)	8.9(8.9)	—	2.6(2.6)	0(0)	0(0)	0(0.6)	0.5(0.5)	0(0)	4.4(4.4)	4.0(4.0)	5.2(5.2)	5.2(5.2)

1	2	3	4	5	6	7	8	9	10	11	12
0(0)	0(0)	1.8(1.8)	1.8(1.8)	5.7(5.7)	0(0)	0(0)	4.3(4.3)	0(0)	0(0)	8.9(8.9)	0(10.1)

14	13	12	11	10	9	8	7	6	5	4	3	2	1
0(0.7)	4.4(4.4)	0(0)	0(0)	4.2(4.2)	0(18.9)	4.4(4.4)	3.0(3.0)	3.6(3.6)	3.8(3.8)	1.1(1.1)	1.6(1.6)	0(0)	8.9(8.9)

12	11	10	9	8	7	6	5	4	3	2	1
8.9(8.9)	8.9(8.9)	0(0)	4.3(4.3)	0(0)	4.0(9.0)	1.1(1.1)	1.1(1.1)	0(0)	7.9(7.9)	0(0)	0(0)

15	16	17	18	19	20	21	22	23	24	25	26	27	28
3.6(3.6)	8.9(8.9)	4.0(4.0)	4.0(4.0)	6.5(6.5)	4.2(4.2)	1.4(1.4)	5.7(5.7)	5.2(5.2)	8.3(2.2)	2.2(2.2)	0(13.1)	1.9(1.9)	0(0)
14	13	12	11	10	9	8	7	6	5	4	3	2	1
3.5(3.2)	3.5(5.0)	0(0)	0(0)	2.1(2.1)	0(0)	1.8(1.8)	2.6(2.6)	4.0(4.0)	2.8(2.8)	5.2(5.2)	1.8(1.8)	0(0)	0.9(10.9)

8	7	6	5	4	3	2	1
6.3(4.5)	3.4(3.2)	0(7.0.9)	0(0)	0(0)	0.6(0.6)	2.0(1.7)	—

1	2	3	4	5	6	7	8
3.6(3.6)	0(7.0.7)	1.4(1.4)	0(0)	3.7(3.7)	0.4(0.4)	0.6(4.4)	8.2(0.1)
16	15	14	13	12	11	10	9
8.0(8.0)	0(0)	0(0)	2.2(2.2)	8.9(8.9)	—	—	0(0)

12	13	14	15	16	17	18	19	20	21	22
0(2.1)	0(10.1)	1.3(1.3)	0.4(0.4)	0.9(0.9)	6.1(6.1)	4.3(4.3)	4.2(4.3)	0(0)	4.4(4.4)	8.2(8.2)
11	10	9	8	7	6	5	4	3	2	1
0(0)	0(2.1(6.1))	0(3.7)	0(0)	0(0)	0(10.1)	0.6(0.6)	0(0)	0(2.0(2.1))	0(0)	0(0)

10	9	8	7	6	5	4	3	2	1
8.2(8.9)	8.9(8.2)	8.7(0)	0(0)	0(0)	11.3(11.3)	11.5(11.5)	11.5(11.5)	0(10.1)	8.9(8.9)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
6.3(0)	0(0)	7.1(0.5)	8.9(0.6)	4.5(4.4)	4.4(4.4)	4.4(4.4)	4.4(4.5)	4.4(4.5)	0(0)	4.4(4.5)	0(0)	4.5(4.5)	8.9(8.9)

Q501	Q502	Q503	Q504	Q505	Q506	Q507
B 0(0)	B 0.6(0.6)	B 5.3(5.3)	B 4.3(4.3)	B 0(0)	B 2.8(2.8)	B —
C 0(0)	C 0(0)	C 5.1(5.1)	C 0(0)	C 8.3(2.2)	C 5.0(5.0)	C —
E 0(0)	E 0(0)	E 8.9(8.9)	E 3.7(3.7)	E 0(0)	E 2.1(2.1)	E 6.7(6.7)

Q508	Q509	Q510	Q511	Q512	Q513	Q514
B 0(0)	B 0(0.7)	B 0.6(0.6)	B 8.9(8.9)	B 0.6(0.6)	B 0(0)	B 0(0)
C 8.2(8.2)	C 0(0)	C 0(0)	C 0(0)	C 0(0)	C 0.6(0.6)	C 0(10.1)
E 0(0)	E 0(0)	E 0(0)	E 8.9(8.9)	E 0(0)	E 0(0)	E 0(0)

Q515	Q516	Q517	Q520	Q701	Q702	Q703
B 0(0)	B 0(0)	B 0(0)	B 0(0)	B 0.6(0.6)	B 0(0.7)	B 9.6(9.6)
C 0(0)	C 0(0)	C 3.0(3.0)	C 0(0)	C 3.7(3.7)	C 4.0(4.0)	C 8.9(8.9)
E 0(0)	E 0(0)	E 0(0)	E 0(0)	E 0(0)	E 0(0)	E 8.9(8.9)

Q704	Q705	Q706	Q707
B 4.5(4.5)	B 0(0.1)	B 8.9(8.2)	B 8.2(8.9)
C 8.9(8.9)	C 0(0)	C 0(8.9)	C 8.9(0.6)
E 6.3(8.8)	E 0(0)	E 8.9(8.9)	E 8.9(8.9)

* VOLTAGES ARE MEASURED IN PLAY MODE,
AND VOLTAGES IN () ARE RECORD MODE.

PG 701

8	5V
7	9V
6	REC 9V
5	PB 9V
4	VIDEO
3	VIDEO
2	GND
1	VIDEO

To
LUMINANCE/
CHROMA
PG202
VIA
CN2721

PG 702

4	RF 9
3	AUDIO OUT
2	GND
1	VIDEO OUT

To
RF MODULATOR
PG001
VIA
CN0712

PG 703

1	S ON S
2	CYL. FG
3	OSC STOP
4	REC 9V
5	EP
6	LP
7	MUTE
8	PLAY
9	9V
10	GND
11	AUDIO
12	GND
13	AUDIO

To
AUDIO
PG401
VIA
CN4713

PG 704

7	—
6	SP/LP/EP
5	GND
4	REMOTE
3	STAND-BY
2	CAMERA
1	C. PAUSE

To
SYSTEM
CONTROL
PG803
VIA
CN7843

PG 705(A)

1	5V	2	—
2	12V	3	—
3	TIME ON	4	—
4	GND	5	—
5	12V(AC)	6	—
6	PLAY	7	—
7	REC	8	—
8	SPEED PLAY	9	—
9	MUTE	10	—
10	9V	11	—
11	CYL. LOCK	12	—
12	SAVE	13	—

To
SYSTEM
CONTROL
PG801(A)
VIA
CN7851

PG 713

4	GND
3	GND
2	PB 9V
1	S ON S

To
S ON S
SWITCH
CN713

PG 705(B)

1	POWER SW ON
2	REMOTE POWER
3	—
4	SLOW
5	FRAME ADV.
6	SEARCH
7	REC/DUB
8	PB/DUB
9	PAUSE
10	LOAD
11	REVERSE
12	CYL ON
13	OSC STOP

To
SYSTEM
CONTROL
PG801(B)
VIA
CN7851

CN 551 (FOR ADJUSTMENT)

9	SW30 (SEARCH)
8	EP/LP
7	SP
6	SP (HEAD SW)
5	GND
4	CAPST. PHASE
3	CYL. PHASE
2	9V
1	SW30Hz

: Soldered side
: Parts side

PG 706

1	+B (CAPST)
2	FB (CAPST)
3	M 9V
4	+B FB
5	+B (CYL)
6	FB (CYL)
7	12V
8	5V
9	9V
10	SEARCH
11	SLOW
12	SEARCH
13	SAVE

To
SWITCHING
REGULATOR
CN706

PG 709

1	GND
2	M 9V

To
LOADING MOTOR DRIVER
PG902
VIA CN7992

PG 710

2	12V
1	GND

To
INT. BATT.
CN710

PG 711

1	15V/12V
2	15V/12V

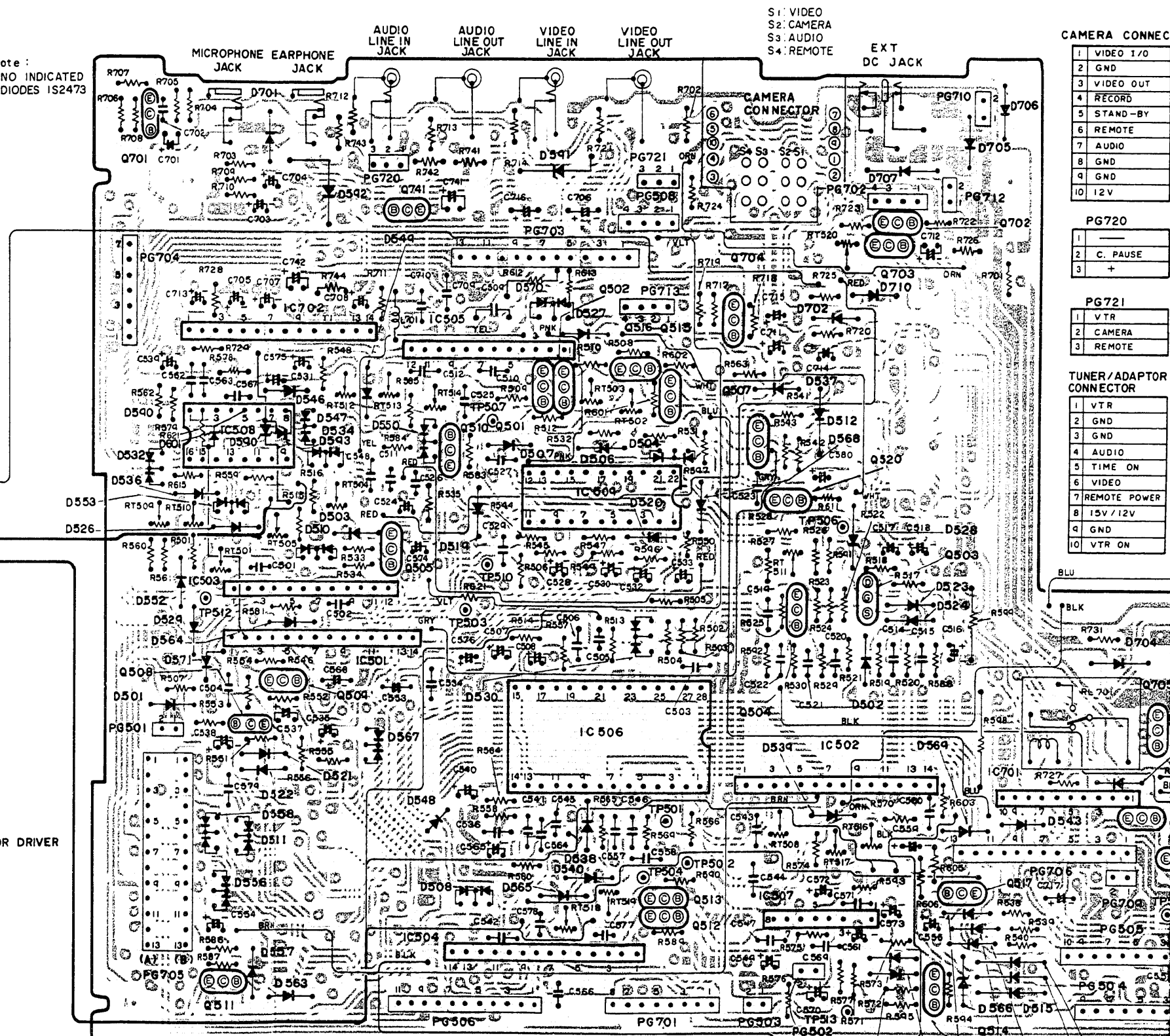
F701 3A

PG 712

2	12V
1	12V

To
S ON S
SWITCH
CN712

Note:
NO INDICATED
DIODES IS2473



CAMERA CONNEC

1	VIDEO I/O
2	GND
3	VIDEO OUT
4	RECORD
5	STAND-BY
6	REMOTE
7	AUDIO
8	GND
9	GND
10	12V

PG 720

1	—
2	C. PAUSE
3	+

PG 721

1	VTR
2	CAMERA
3	REMOTE

TUNER/ADAPTOR CONNECTOR

1	VTR
2	GND
3	GND
4	AUDIO
5	TIME ON
6	VIDEO
7	REMOTE POWER
8	15V/12V
9	GND
10	VTR ON

Note :
NO INDICATED
DIODES IS2473

S1: VIDEO
S2: CAMERA
S3: AUDIO
S4: REMOTE

EXT
DC JACK

CAMERA CONNECTOR

1	VIDEO I/O
2	GND
3	VIDEO OUT
4	RECORD
5	STAND-BY
6	REMOTE
7	AUDIO
8	GND
9	GND
10	12V

1	—	To S ON S SWITCH CN720
2	C. PAUSE	
3	+	

1	VTR	To S ON S SWITCH CN721
2	CAMERA	
3	REMOTE	

TUNER/ADAPTOR CONNECTOR

1	VTR
2	GND
3	GND
4	AUDIO
5	TIME ON
6	VIDEO
7	REMOTE POWER
8	15V/12V
9	GND
10	VTR ON

PG 501

1	TRACKING
2	TRACKING

PG 502

1	CONTROL PULSE
2	GND

PG 503

1	TACH PULSE
2	GND

PG 504

9	SP
8	FB (CYL)
7	+B (CYL)
6	4V
5	CYL SERVO
4	HALL BIAS
3	MOTOR GND
2	CYL FG(-)
1	CYL FG(+)

PG 505

10	+B FB
9	4V
8	C. SERVO
7	HALL BIAS
6	FB (CAPST)
5	MOTOR GND
4	CFG (+)
3	CFG (-)
2	+B (CAPST)
1	REVERSE

To TRACKING VOLUME CN501

To CONTROL HEAD CN502

To TACH HEAD CN503

To CYLINDER MOTOR CN504

To CAPSTAN MOTOR CN505

RT501 PULSE WIDTH

RT502 EP STABILITY

RT503 SP STABILITY

RT504 LP/EP CH-1 PHASE

RT505 SP CH-1 PHASE

RT508 CYLINDER SPEED

RT509 LP TRACKING PRESET

RT510 SP TRACKING PRESET

RT511 CAPSTAN SPEED

RT512 SP SLOW BRAKE PULSE

RT513 EP SLOW BRAKE PULSE

RT514 EP TRACKING PRESET

RT516 SP CAPSTAN SLOW

RT517 SP CAPSTAN SLOW

RT518 REVERSE SEARCH SW30Hz

RT519 SEARCH SW30Hz

RT520 REC CTL PHASE

1	GND
2	SYNC
3	SW30Hz
4	LOAD
5	REC START
6	SP
7	LP
8	EP
9	SPEED PLAY
10	—
11	3.58MHz

To LUMINANCE/CHROMA PG203 VIA CN2536

1	SLOW TRACKING
2	REMOTE
3	GND
4	VAR SLOW

To JACK CN508

1	GND
---	-----

To LUMINANCE/CHROMA TP206

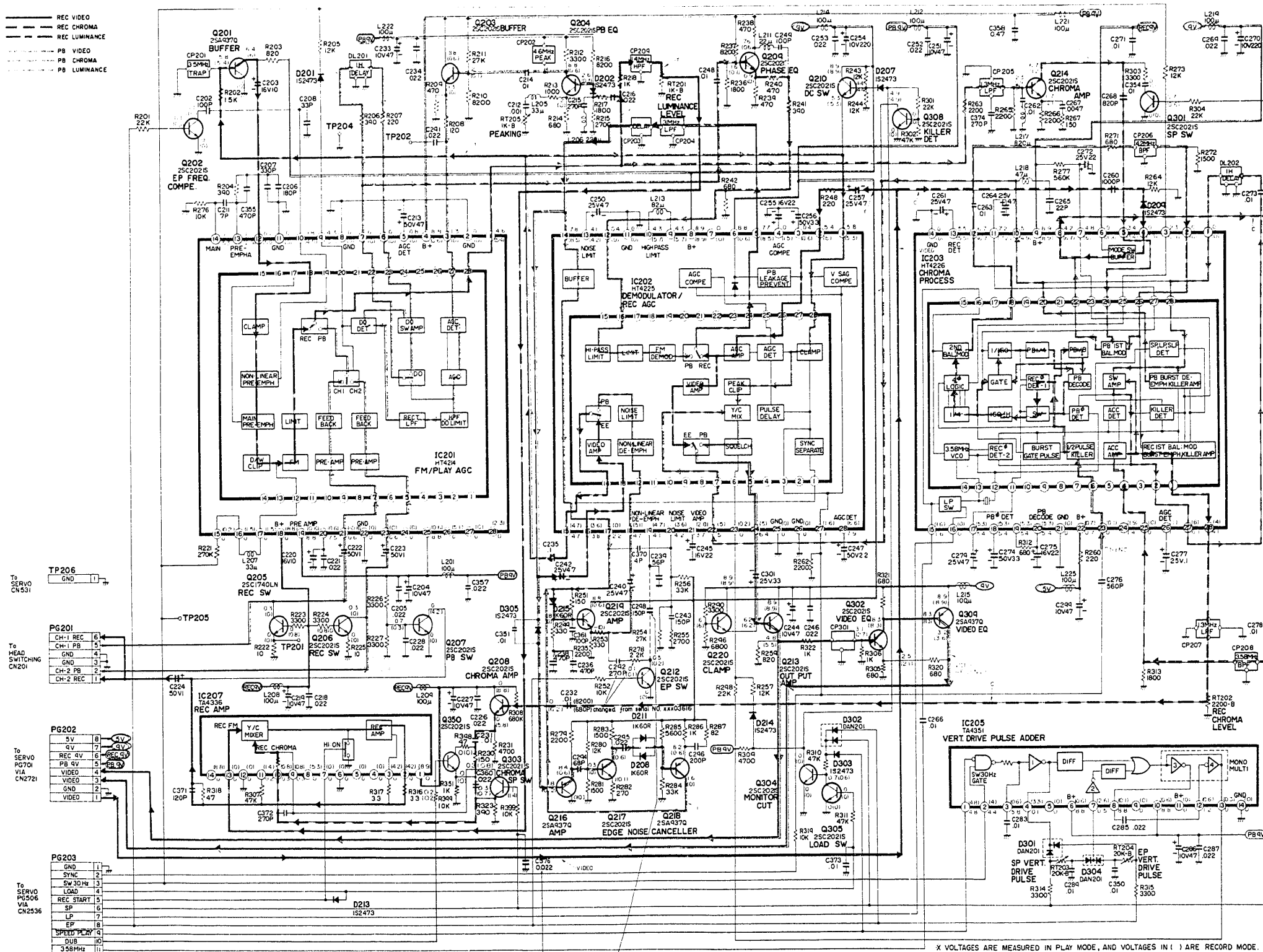
To JACK

The holes of which surroundings are registered through-hole type.

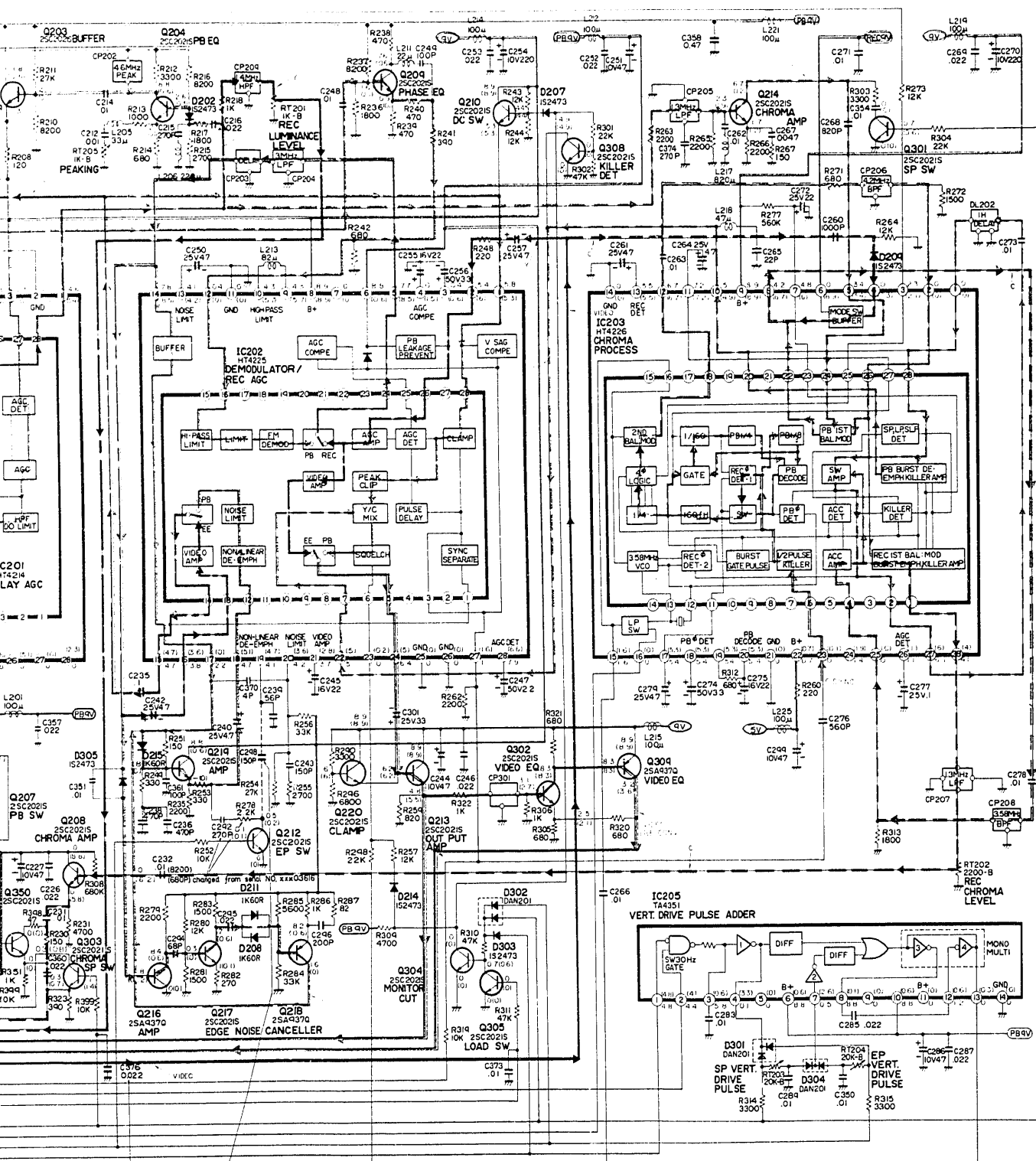
SERVO C. B. A

D545 D544 D516 D517 D518 D514 D513

	REC VIDEO
	REC CHROMA
	REC LUMINANCE
	PB VIDEO
	PB CHROMA
	PB LUMINANCE



X VOLTAGES ARE MEASURED IN PLAY MODE, AND VOLTAGES IN () ARE RECORD MODE

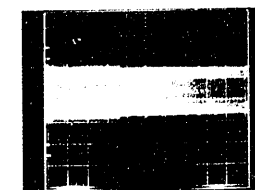


added for the units
with the serial NO. xxx03616
and later.

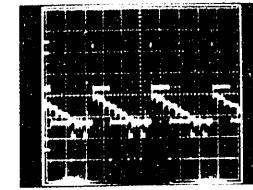
C248 Deleted starting from
serial NO. xxx03616 ON.

X VOLTAGES ARE MEASURED IN PLAY MODE, AND VOLTAGES IN () ARE RECORD MODE.

LUMINANCE/CHROMA WAVEFORMS



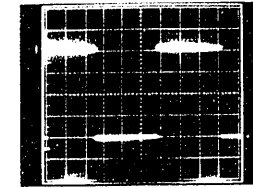
TP201 REC
50mV/2msec. div.



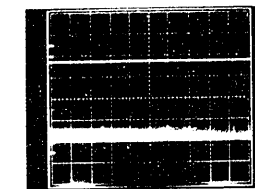
IC201/16 REC
0.2V/20μsec. div.



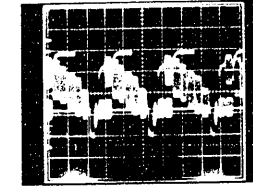
PG203-11 REC
0.1V/2msec. div.



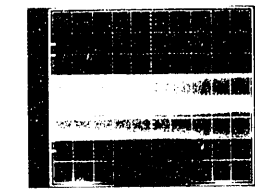
TP205 PLAY
2V/5msec. div.



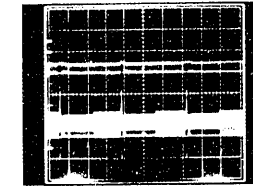
IC202-27 REC
2V/5msec. div.



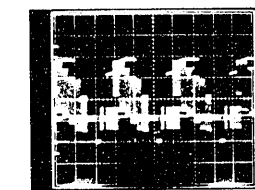
Q213-E PLAY
0.5V/20μsec. div.



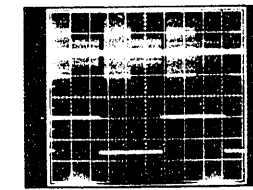
IC207-2 REC
1V/2msec. div.



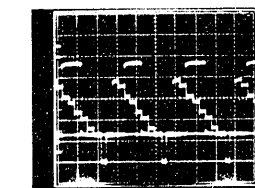
IC205-13 PLAY
20mV/5msec. div.



Q213-E REC
0.5V/20μsec. div.



IC203-28 REC 5V/5msec. div.
SW30Hz 5V/5msec. div.



IC201-12 REC
0.2V/20μsec. div.

LUMINANCE / CHROMA C.B.A

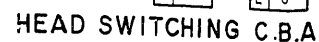
To
SERVO
PG506
VIA
CN2536



Q 304

B	0.7(0.6)
C	0(0)
E	0(0)

: Soldered side
: Parts side
The holes of which are through-hole type.



28	4.1(4.0)	1	0(0)
27	6.1(6.0)	2	0(0)
26	1.1(1.0)	3	2.3(2.1)
25	0(0)	4	0(7.3)
24	1.4(1.9)	5	3.4(3.4)
23	0(0.1)	6	0(8.9)
22	0.7(0.7)	7	4.8(6.0)
21	0(0)	8	4.2(6.7)
20	5.4(5.3)	9	8.9(8.4)
19	5.4(5.3)	10	5.0(4.9)
18	5.4(5.3)	11	7.2(7.2)
17	5.4(5.3)	12	6.7(6.7)
16	0(0)	13	5.5(5.5)
15	1.6(1.6)	14	0(0)

14	13	12	11	10	9	8	7	6	5	4	3	2	1
0(8.8)	0(0)	0(0)	0.2(1.4)	0.3(0.8)	0.3(0.8)	0(5.3)	0(0)	0(0)	0(0)	0(0)	0(4.2)	0(4.2)	0(8.9)

Q208	Q209	Q210	Q212	Q213	Q214	Q216
B 0 (6.2)	B 1.6 (0.1)	B 4.4 (4.4)	B 0.1 (0.1)	B 6.2 (6.2)	B 2.3 (1.4)	B 8.0 (0.2)
C 0 (8.8)	C 7.6 (0.6)	C 8.9 (8.9)	C 0.5 (0.2)	C 8.9 (8.9)	C 6.7 (1.2)	C 0 (0)
E 0 (5.8)	E 0.9 (0)	E 5.3 (5.3)	E 0 (0)	E 4.8 (5.5)	E 1.7 (1.2)	E 8.4 (0.6)

Q217	Q218	Q219	Q220	Q301	Q302	Q303
B 0.3 (0)	B 7.6 (0.5)	B 1.8 (0)	B 6.0 (6.0)	B 0.7 (0.6)	B 3.1 (2.7)	B 1.0 (1.4)
C 7.0 (0.6)	C 1.6 (0)	C 8.8 (0.6)	C 8.9 (8.4)	C 0 (0)	C 8.3 (8.3)	C 0.3 (0.8)
E 1.0 (0.1)	E 8.2 (0.6)	E - (0)	E 6.2 (6.2)	E 0 (0)	E 2.5 (2.1)	E 0.3 (0.7)

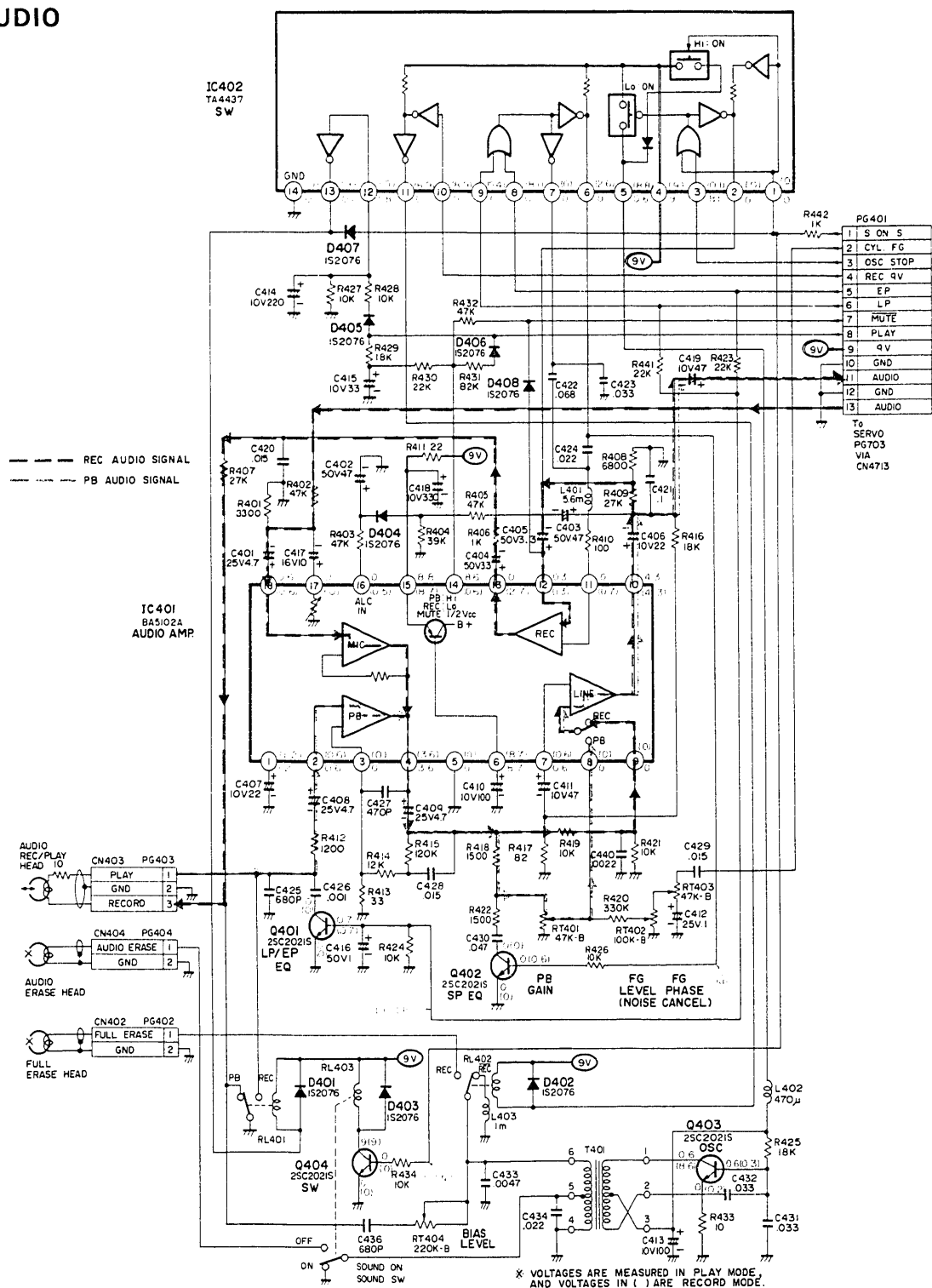
Q304	Q305	Q308	Q309	Q350
B 0.7(0.6)	B 0 (0)	B 0 (0)	B 8.3(8.3)	B 0.2(0.2)
C 0 (0)	C 0.7(0.6)	C 4.9(4.9)	C 3.2(3.6)	C 0 (0)
E 0 (0)	E 0 (0)	E 0 (0)	E 8.9(8.9)	E 0 (0)

* VOLTAGES ARE MEASURED IN PLAY MODE,
AND VOLTAGES IN () ARE RECORD MODE.

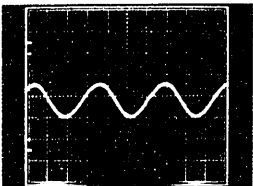
: Parts side

95

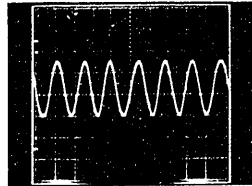
AUDIO



AUDIO WAVEFORMS



PG401-11 PLAY 3kHz
1V/0.2msec. div.



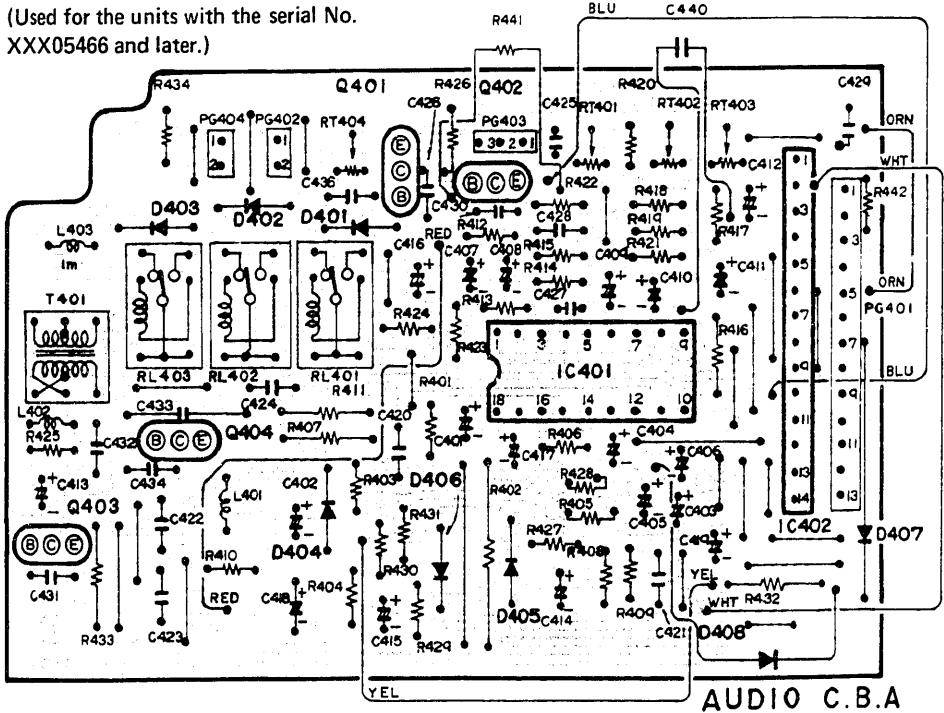
PG403-3 REC
20V/10µsec. div.

RT404
BIAS
LEVEL

RT401
PB
GAIN

RT402 RT403
FG FG
LEVEL LEVEL
PHASE PHASE
(NOISE CANCEL)

(Used for the units with the serial No.
XXX05466 and later.)



IC402

1	0 (0)
2	0 (0)
3	8.1 (0.1)
4	9.0 (9.0)
5	0.6 (8.8)
6	0 (2.6)
7	0 (0)
8	0.1 (8.1)
9	0 (0.4)
10	0 (8.4)
11	0.1 (8.9)
12	1.8 (0)
13	0.1 (9.0)
14	0 (0)

PG401

1	S ON S
2	CYL FG
3	OSC STOP
4	REC 9V
5	EP
6	LP
7	MUTE
8	PLAY
9	9V
10	GND
11	AUDIO
12	GND
13	AUDIO

To
SERVO
PG703
VIA
CN4713

PG402

1	FULL ERASE
2	GND

To
FULL
ERASE HEAD
CN402

PG403

1	PLAY
2	GND
3	RECORD

To
AUDIO
REC/PB HEAD
CN403

PG404

1	AUDIO ERASE
2	GND

To
AUDIO
ERASE HEAD
CN404

IC401

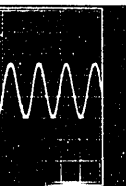
1	2	3	4	5	6
1.2 (1.2)	0.6 (0.6)	0 (0)	3.6 (3.6)	0 (0)	8.7 (8.7)
1.8	1.7	1.6	1.5	1.4	1.3
0.6 (0.6)	0 (0)	0 (0.5)	8.8 (8.7)	8.6 (0.6)	0 (2.7)

Q401
B 0.7 (0.7)
C 0 (0)
E 0 (0)

Q402
B 0 (0.6)
C 0 (0)
E 0 (0)

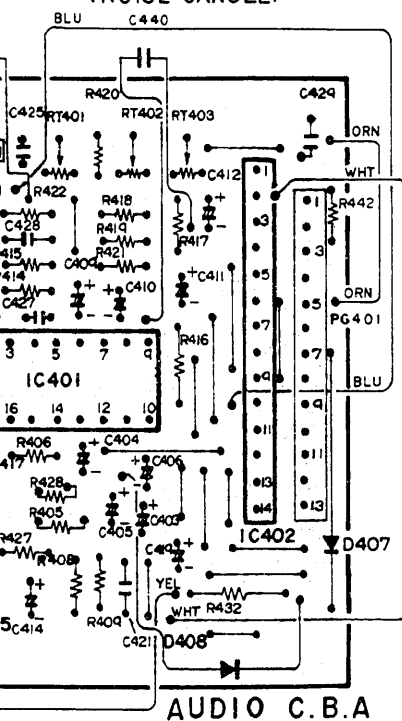
Q403
B 0.6 (0.3)
C 0.6 (8.6)
E 0 (0.2)

* VOLTAGES ARE MEASURED
AND VOLTAGES IN () A



C
div.

RT401 RT402 RT403
PB FG FG
AIN LEVEL PHASE
(NOISE CANCEL)



IC402

1	0 (0)
2	0 (0)
3	8.1 (0.1)
4	9.0 (9.0)
5	0.6 (8.8)
6	0 (2.6)
7	0 (0)
8	0.1 (8.1)
9	0 (0.4)
10	0 (8.9)
11	0.1 (8.9)
12	1.8 (0)
13	0.1 (9.0)
14	0 (0)

IC401

1	2	3	4	5	6	7	8	9
1.2 (1.2)	0.6 (0.6)	0 (0)	3.6 (3.6)	0 (0)	8.7 (8.7)	0.6 (0.6)	0 (0)	0 (0)
18	17	16	15	14	13	12	11	10
0.6 (0.6)	0 (0)	0 (0.5)	8.8 (8.7)	8.6 (0.6)	0 (2.7)	0.3 (1.3)	0 (0.7)	4.3 (4.3)

Q401
B 0.7 (0.7)
C 0 (0)
E 0 (0)

Q402
B 0 (0.6)
C 0 (0)
E 0 (0)

Q403
B 0.6 (0.3)
C 0.6 (8.6)
E 0 (0.2)

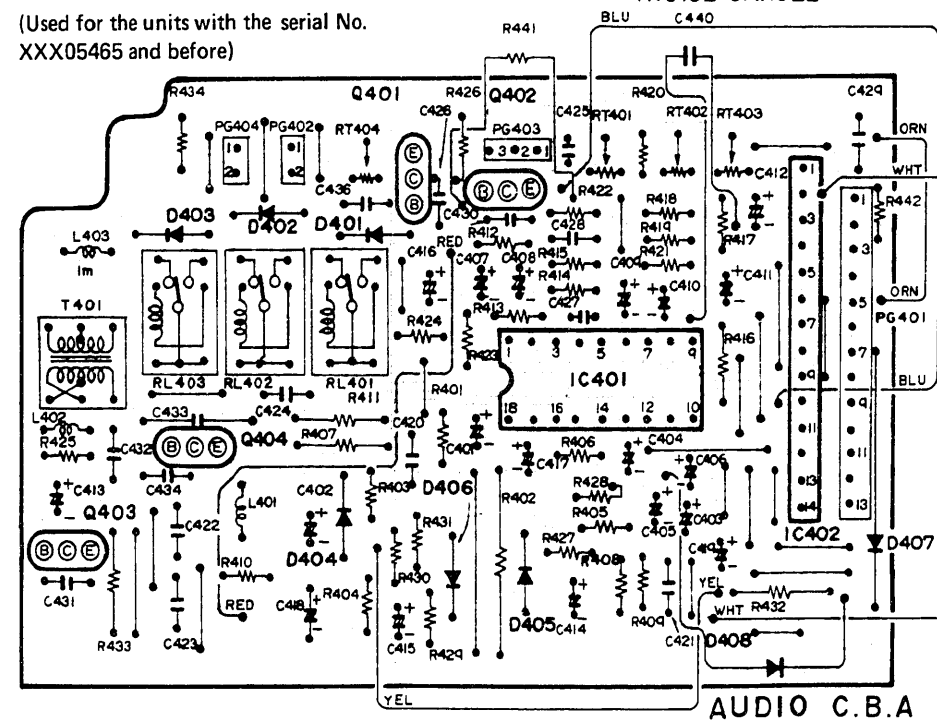
Q404
B 0 (0)
C 9.0 (9.0)
E 0 (0)

* VOLTAGES ARE MEASURED IN PLAY MODE,
AND VOLTAGES IN () ARE RECORD MODE.

RT404
BIAS
LEVEL

RT401 RT402 RT403
PB FG FG
GAIN LEVEL PHASE
(NOISE CANCEL)

(Used for the units with the serial No.
XXX05465 and before)



IC402

1	0 (0)
2	0 (0)
3	8.1 (0.1)
4	9.0 (9.0)
5	0.6 (8.8)
6	0 (2.6)
7	0 (0)
8	0.1 (8.1)
9	0 (0.4)
10	0 (8.9)
11	0.1 (8.9)
12	1.8 (0)
13	0.1 (9.0)
14	0 (0)

IC401

1	2	3	4	5	6	7	8	9
1.2 (1.2)	0.6 (0.6)	0 (0)	3.6 (3.6)	0 (0)	8.7 (8.7)	0.6 (0.6)	0 (0)	0 (0)
18	17	16	15	14	13	12	11	10
0.6 (0.6)	0 (0)	0 (0.5)	8.8 (8.7)	8.6 (0.6)	0 (2.7)	0.3 (1.3)	0 (0.7)	4.3 (4.3)

Q401
B 0.7 (0.7)
C 0 (0)
E 0 (0)

Q402
B 0 (0.6)
C 0 (0)
E 0 (0)

Q403
B 0.6 (0.3)
C 0.6 (8.6)
E 0 (0.2)

Q404
B 0 (0)
C 9.0 (9.0)
E 0 (0)

* VOLTAGES ARE MEASURED IN PLAY MODE,
AND VOLTAGES IN () ARE RECORD MODE.

PG401

1	S ON S
2	CYL FG
3	OSC STOP
4	REC 9V
5	EP
6	LP
7	MUTE
8	PLAY
9	9V
10	GND
11	AUDIO
12	GND
13	AUDIO

To
SERVO
PG703
VIA
CN4713

PG402

1	FULL ERASE
2	GND

To
FULL
ERASE HEAD
CN402

PG403

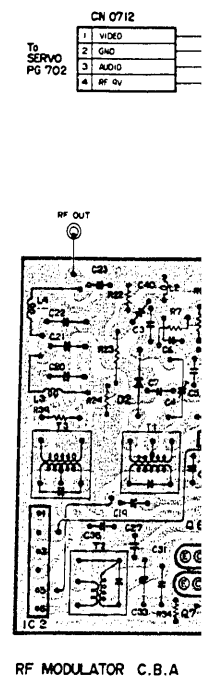
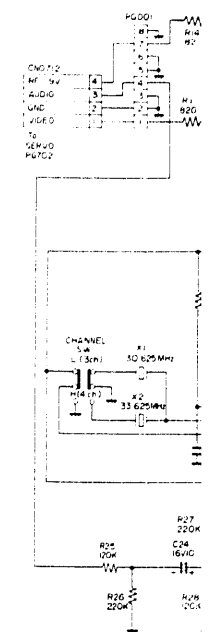
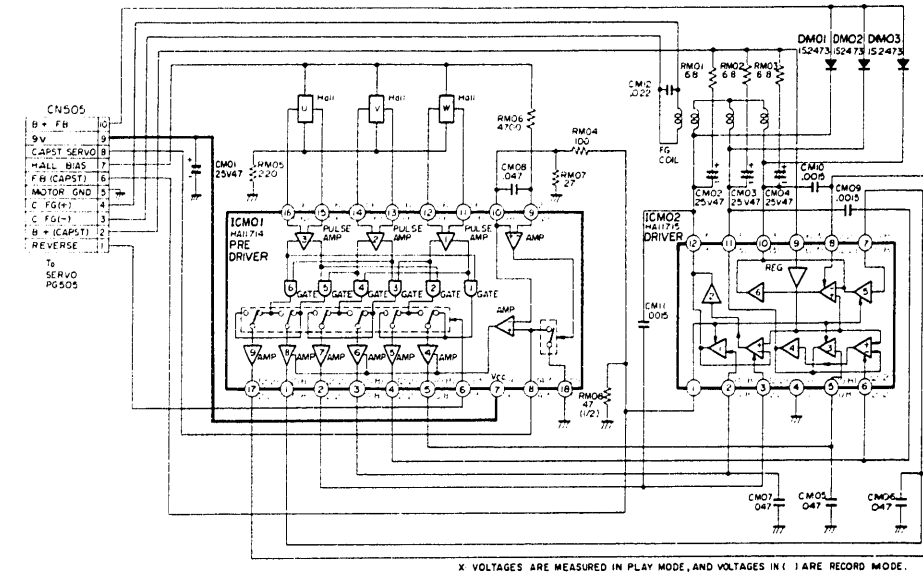
1	PLAY
2	GND
3	RECORD

To
AUDIO
REC/PB HEAD
CN403

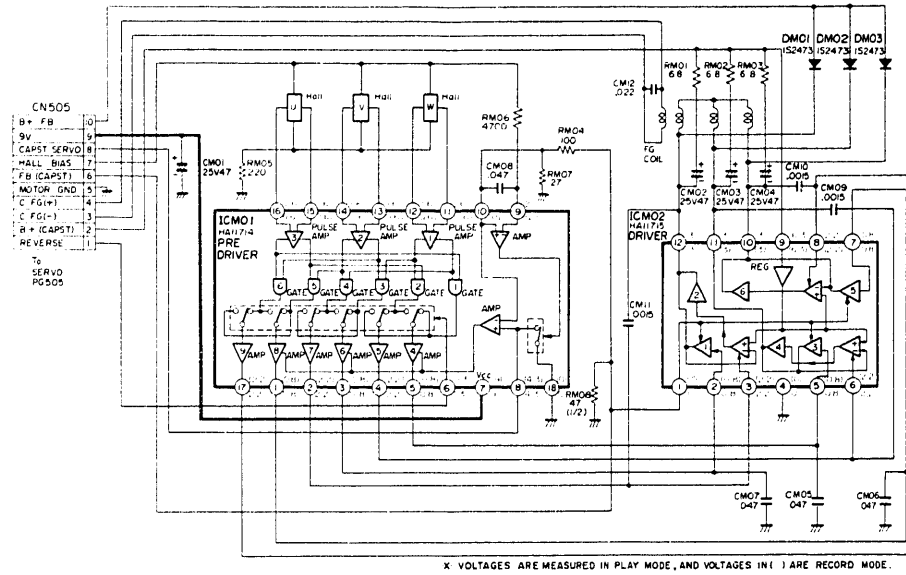
PG404

1	AUDIO ERASE
2	GND

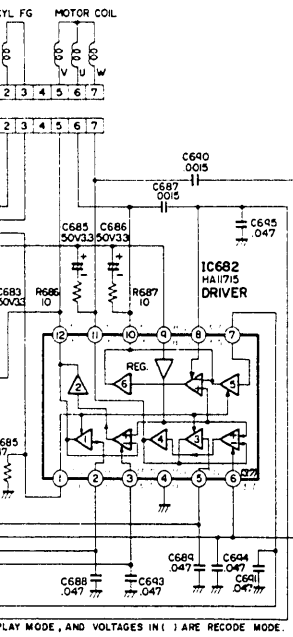
To
AUDIO
ERASE HEAD
CN404



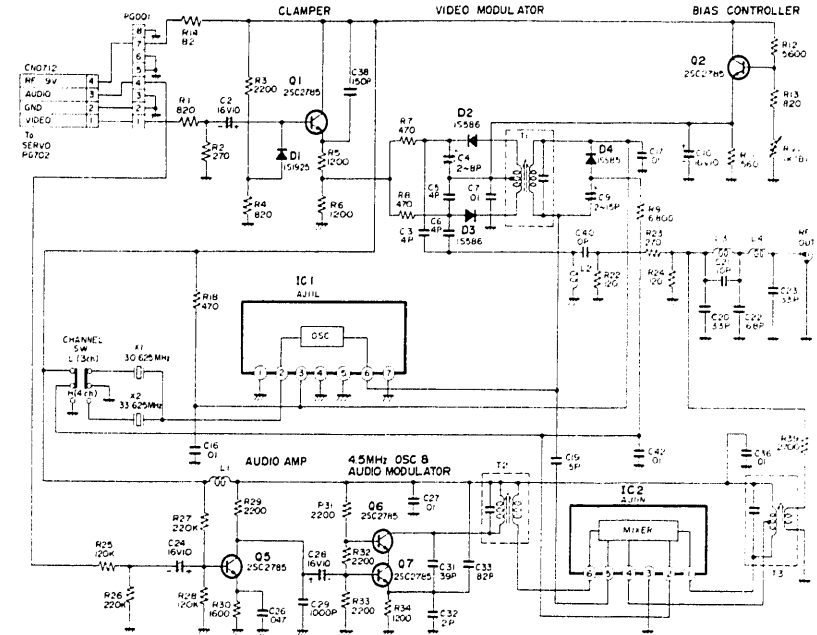
CAPSTAN MOTOR



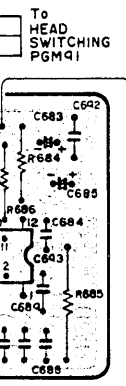
X: VOLTAGES ARE MEASURED IN PLAY MODE, AND VOLTAGES IN () ARE RECORD MODE



RF CONVERTER

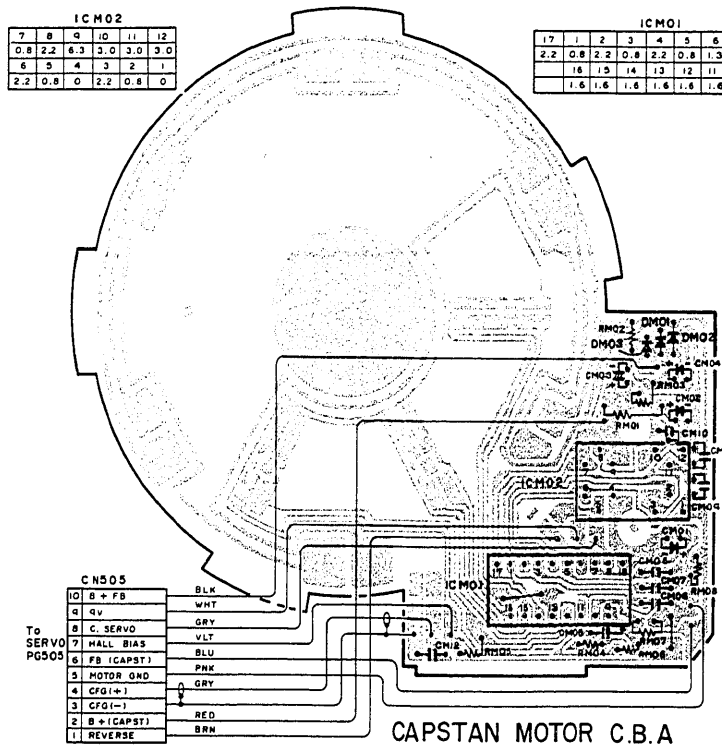


RF MODULATOR C.B.A



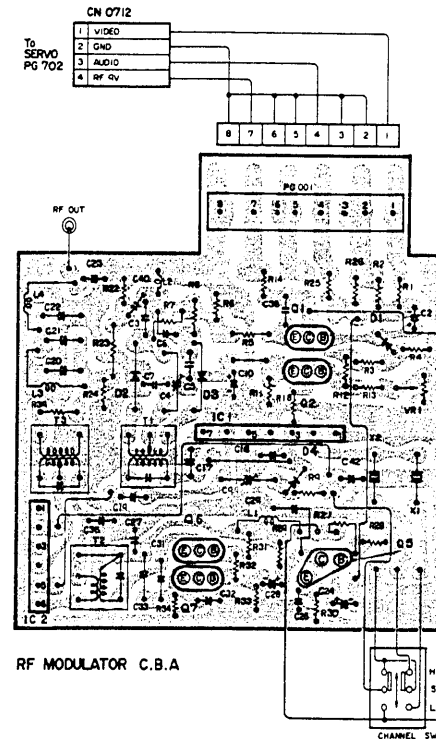
7	8	9	10	11	12
0.8	2.2	6.3	3.0	3.0	3.0
6	5	4	3	2	1
2.2	0.8	0	2.2	0.8	0

ICMOI									
17	1	2	3	4	5	6	7	8	18
2.2	0.8	2.2	0.8	2.2	0.8	1.3	9.0	4.3	0
	16	15	14	13	12	11	10	9	
	1.6	1.6	1.6	1.6	1.6	1.6	0	2.0	



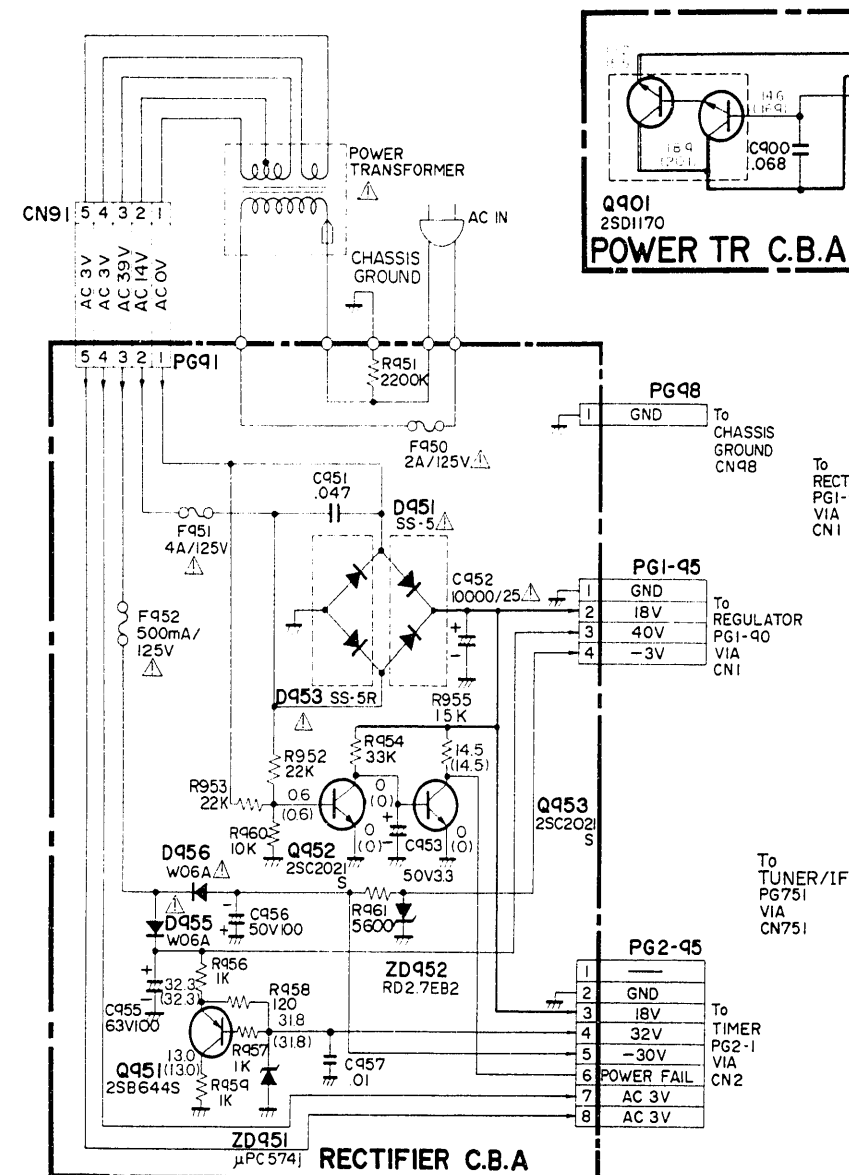
CAPSTAN MOTOR C.B.A

IC 682					
7	8	9	10	11	12
1.0	3.7	8.2	5.0	5.0	5.0
6	5	4	3	2	1
3.7	1.0	0	3.7	1.0	0.1

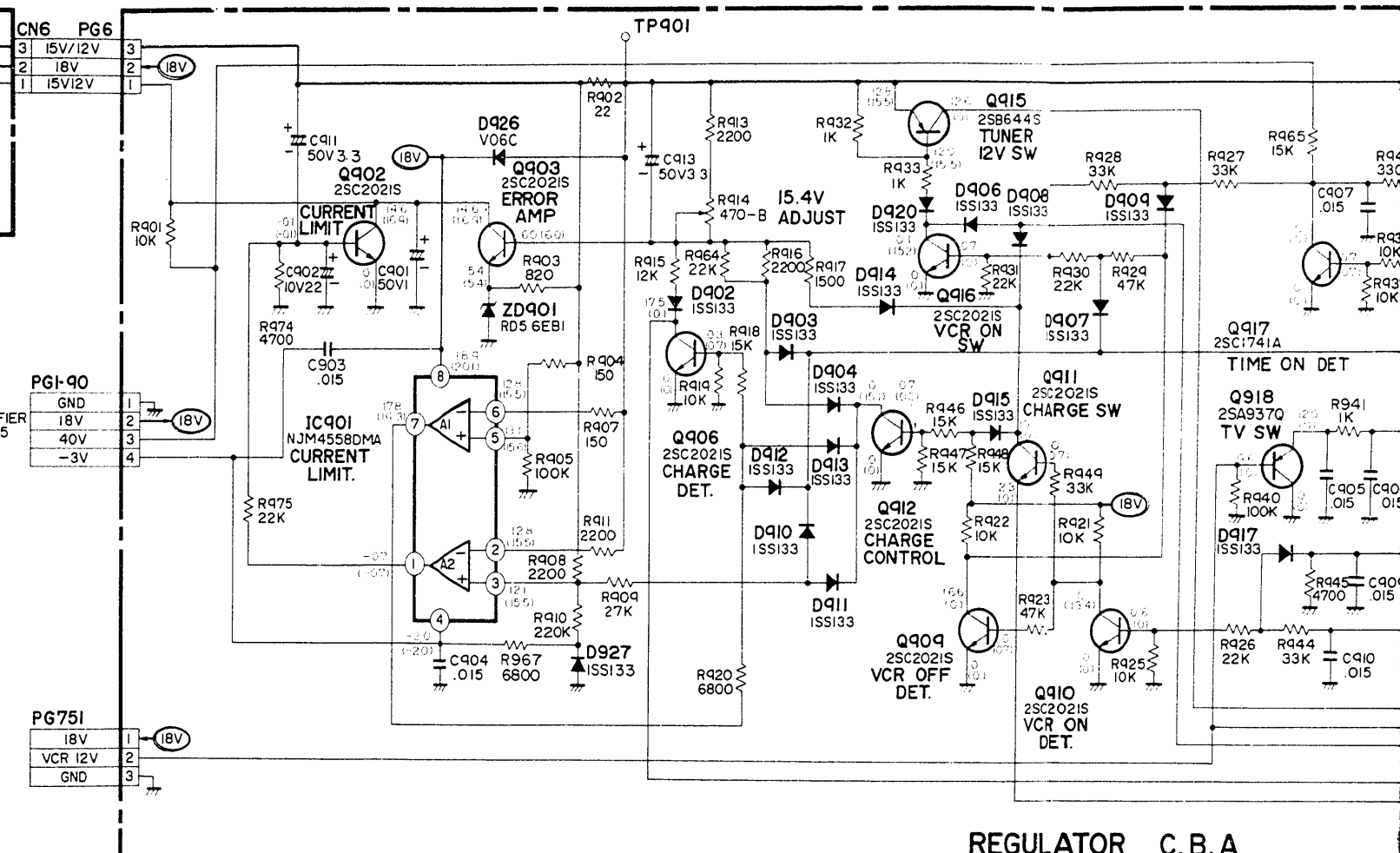


RF MODULATOR C.B.A

RECTIFIER, REGULATOR

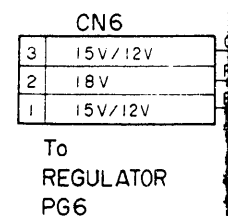
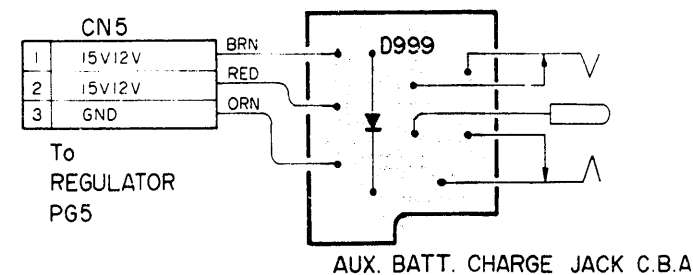


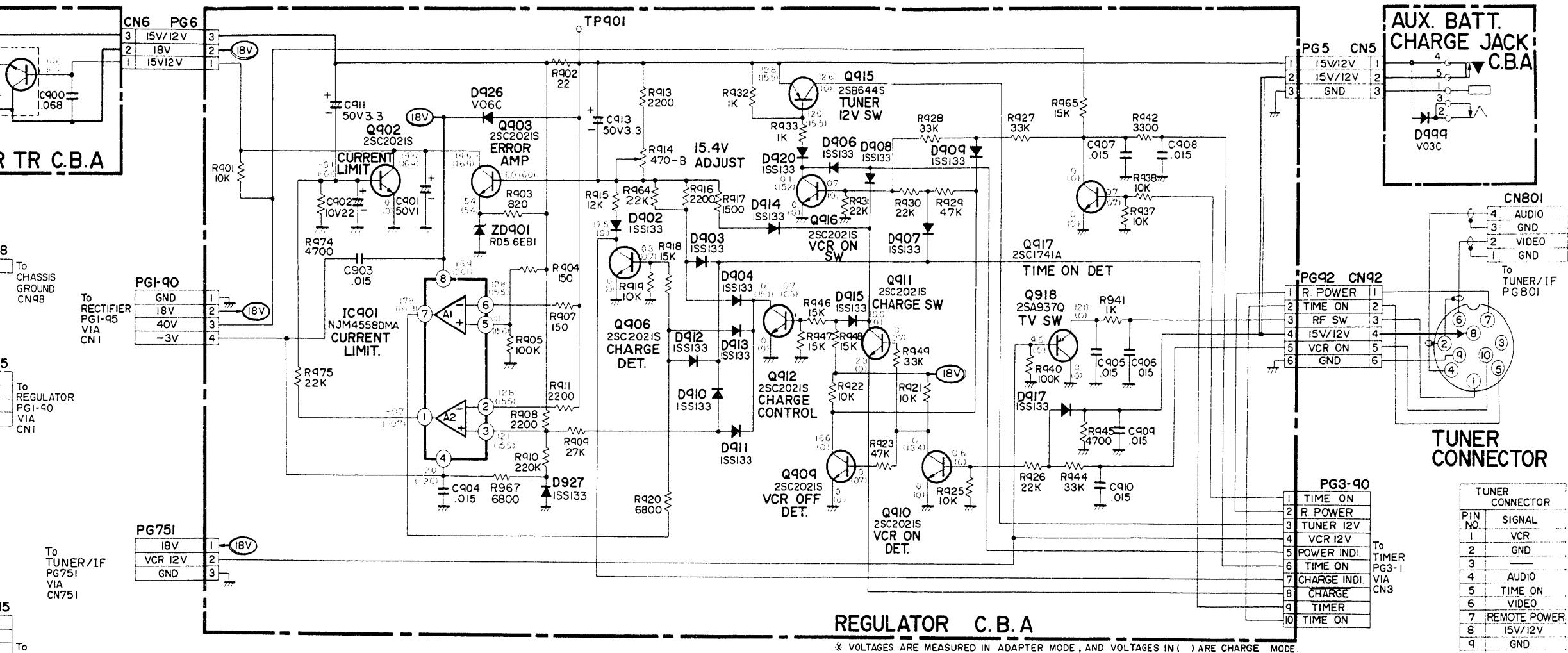
* VOLTAGES ARE MEASURED IN PLAY MODE,
AND VOLTAGES IN () ARE RECODE MODE.



REGULATOR C.B.A

* VOLTAGES ARE MEASURED IN ADAPTER MODE, AND VOLTAGE



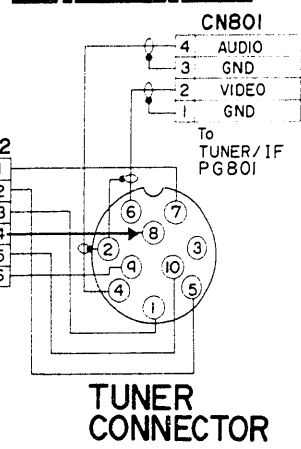
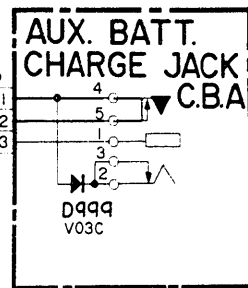


To CHASSIS GROUND CN98

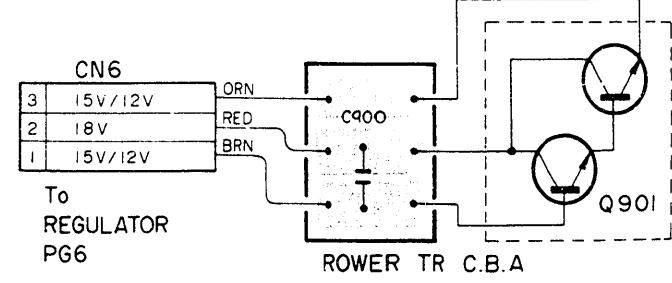
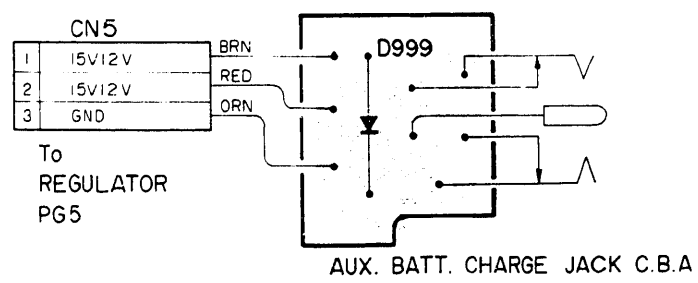
To REGULATOR PG1-90 VIA CN1

To TUNER/IF PG751 VIA CN751

To TIMER PG2-1 VIA CN2

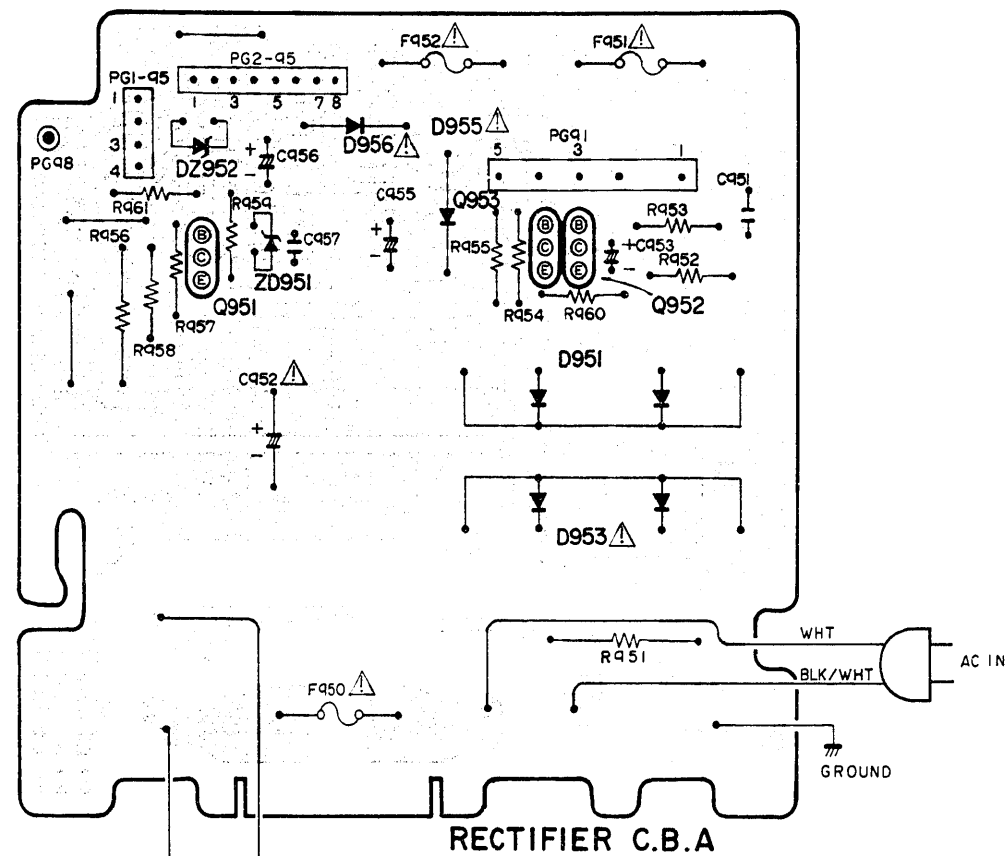


PIN NO.	SIGNAL
1	VCR
2	GND
3	GND
4	AUDIO
5	TIME ON
6	VIDEO
7	REMOTE POWER
8	15V/12V
9	GND
10	VCR ON

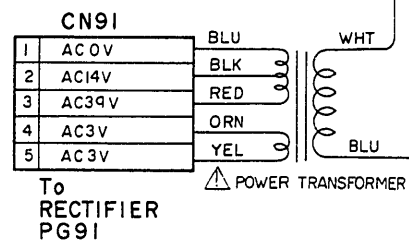


Q 901	VOLTAGE
B	14.6 (16.9)
C	18.9 (20.1)
E	13.2 (15.5)

* VOLTAGES ARE MEASURED IN PLAY MODE, AND VOLTAGES IN () ARE CHARGE MODE.



RECTIFIER C.B.A



To
RECTIFIER
PG91

PG91	
1	AC0V
2	AC14V
3	AC39V
4	AC3V
5	AC3V

To
POWER
TRANSFORMER
CN91

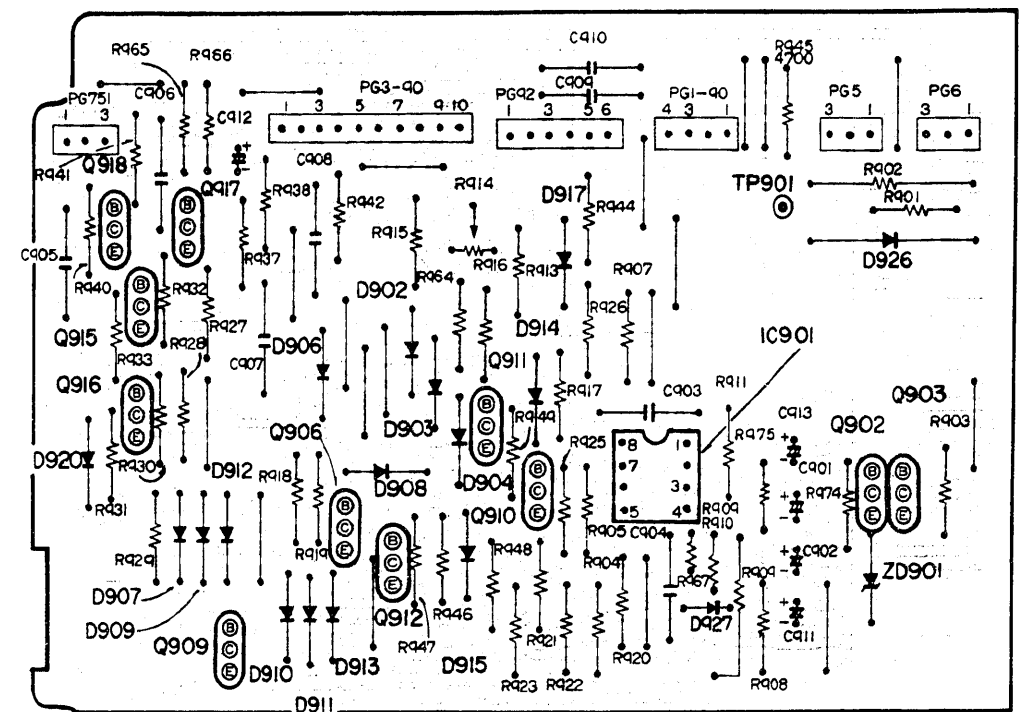
PG98	
1	GND

To
CHASSIS
GROUND
CN98

Q951		Q952		Q953	
B	31.8	B	0.6	B	0
C	13.0	C	0	C	14.5
E	32.3	E	0	E	0

PG1-95		To REGULATOR PG1-90 VIA CN1
1	GND	
2	18V	
3	40V	
4	-3V	

PG2-95		To TIMER PG2-1 CN2
1	---	
2	GND	
3	18V	
4	32V	
5	-30V	
6	POWER FAIL	
7	AC3V	
8	AC3V	



REGULATOR C.B.A

PG1-90		To RECTIFIER PG1-95 VIA CN1
1	GND	
2	18V	
3	40V	
4	-3V	

PG3-90		To TIMER PG3-1 VIA CN3
1	TIME ON	
2	R. POWER	
3	TUNER12V	
4	VCR12V	
5	POWER INDI.	
6	TIME OUT	
7	CHARGE INDI.	
8	CHARGE	
9	TIMER	
10	TIME ON	

IC901	
8	18.4(20.1)
7	17.8(19.3)
6	12.8(15.5)
5	13.1(15.6)
1	-0.7(-0.7)
2	12.8(15.5)
3	12.1(15.5)
4	-2.0(-2.0)

PG5		To AUX. BATT. CHARGE JACK CN5
1	15V/12V	
2	15V/12V	
3	GND	

PG6		To POWER TR CN6
3	15V/12V	
2	18V	
1	15V/12V	

PG92		To TUNER CONNECTOR CN92
1	R. POWER	
2	TIME OUT	
3	RF SW	
4	15V/12V	
5	VCR ON	
6	GND	

PG751		To TUNER / IF PG751 VIA CN751
1	18V	
2	VCR 12V	
3	GND	

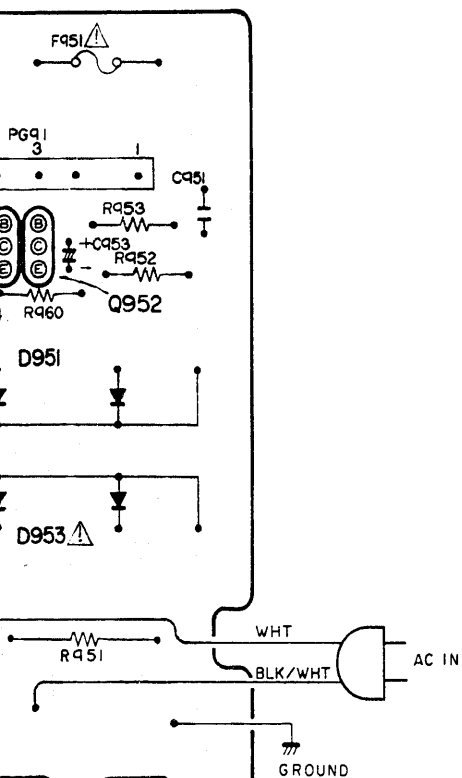
Q902		Q903	
B	-0.1(-0.1)	B	6.0
C	14.6(16.4)	C	14.6
E	0(0)	E	5.4(5.5)

Q909		Q910	
B	0(0.7)	B	0.6
C	16.6(18)	C	0(13)
E	0(0)	E	0

Q912		Q913	
B	0.7(0.3)	B	12.0
C	0(15.1)	C	12.6
E	0(0)	E	12.8

Q917		Q918	
B	0.7(0.7)	B	9.6
C	0(0)	C	0(0)
E	0(0)	E	12.0

* VOLTAGES ARE MEASURED IN ADAPTER MODE, AND VOLTAGES IN (

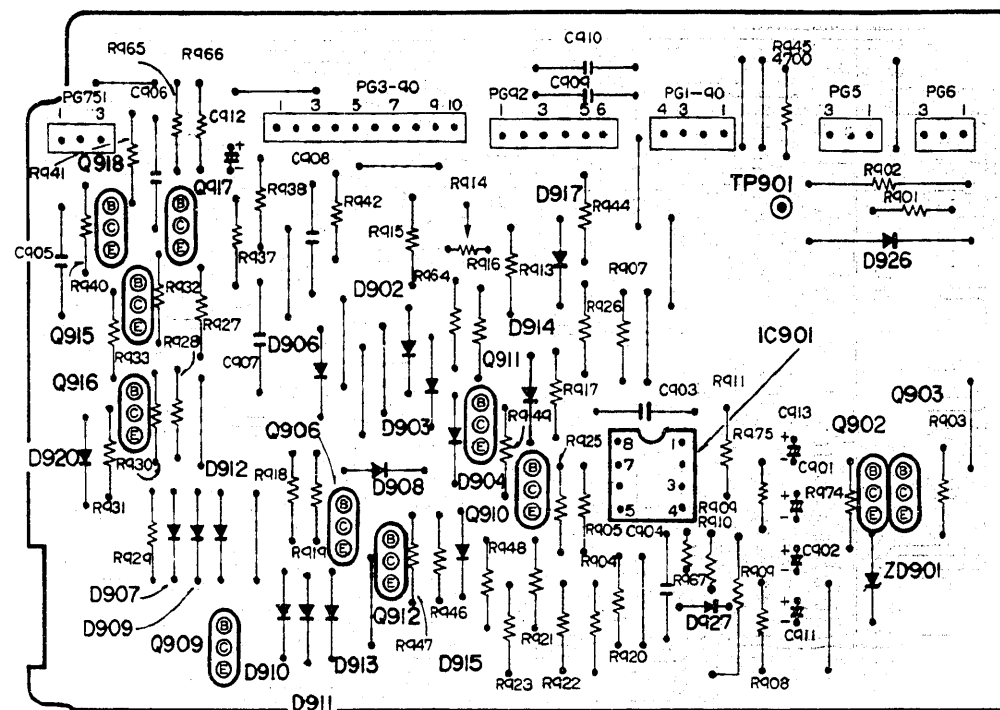


Rectifier C.B.A.

Q952	Q953
B 0.6	B 0
C 0	C 14.5
E 0	E 0

PG1-95	To REGULATOR PG1-90 VIA CN1
1 GND	
2 18V	
3 40V	
4 -3V	

PG2-95	To TIMER PG2-1 CN2
1 GND	
2 1V	
3 2V	
4 30V	
5 POWER FAIL	
6 3V	
7 3V	



REGULATOR C.B.A

PG1-90	To RECTIFIER PG1-95 VIA CN1
1 GND	
2 18V	
3 40V	
4 -3V	

PG3-90	To TIMER PG3-1 VIA CN3
1 TIME ON	
2 R. POWER	
3 TUNER 12V	
4 VCR 12V	
5 POWER IND.	
6 TIME OUT	
7 CHARGE IND.	
8 CHARGE	
9 TIMER	
10 TIME ON	

IC901	
1 18.9(20.1)	1 -0.7(-0.7)
2 17.8(19.3)	2 12.8(15.5)
3 12.8(15.5)	3 12.1(15.5)
4 13.1(15.6)	4 -2.0(-2.0)

PG5	To AUX. BATT. CHARGE JACK CN5
1 15V/12V	
2 15V/12V	
3 GND	

PG6	To POWER TR CN6
1 15V/12V	
2 18V	
3 15V/12V	

PG92	To TUNER CONNECTOR CN92
1 R. POWER	
2 TIME OUT	
3 RF SW	
4 15V/12V	
5 VCR ON	
6 GND	

PG751	To TUNER / IF PG751 VIA CN751
1 18V	
2 VCR 12V	
3 GND	

Q902	Q903	Q906
B -0.1(-0.1)	B 6.0(6.0)	B 0.3(0.7)
C 14.6(16.9)	C 14.6(16.9)	C 17.5(0)
E 0(0)	E 5.4(5.4)	E 0(0)

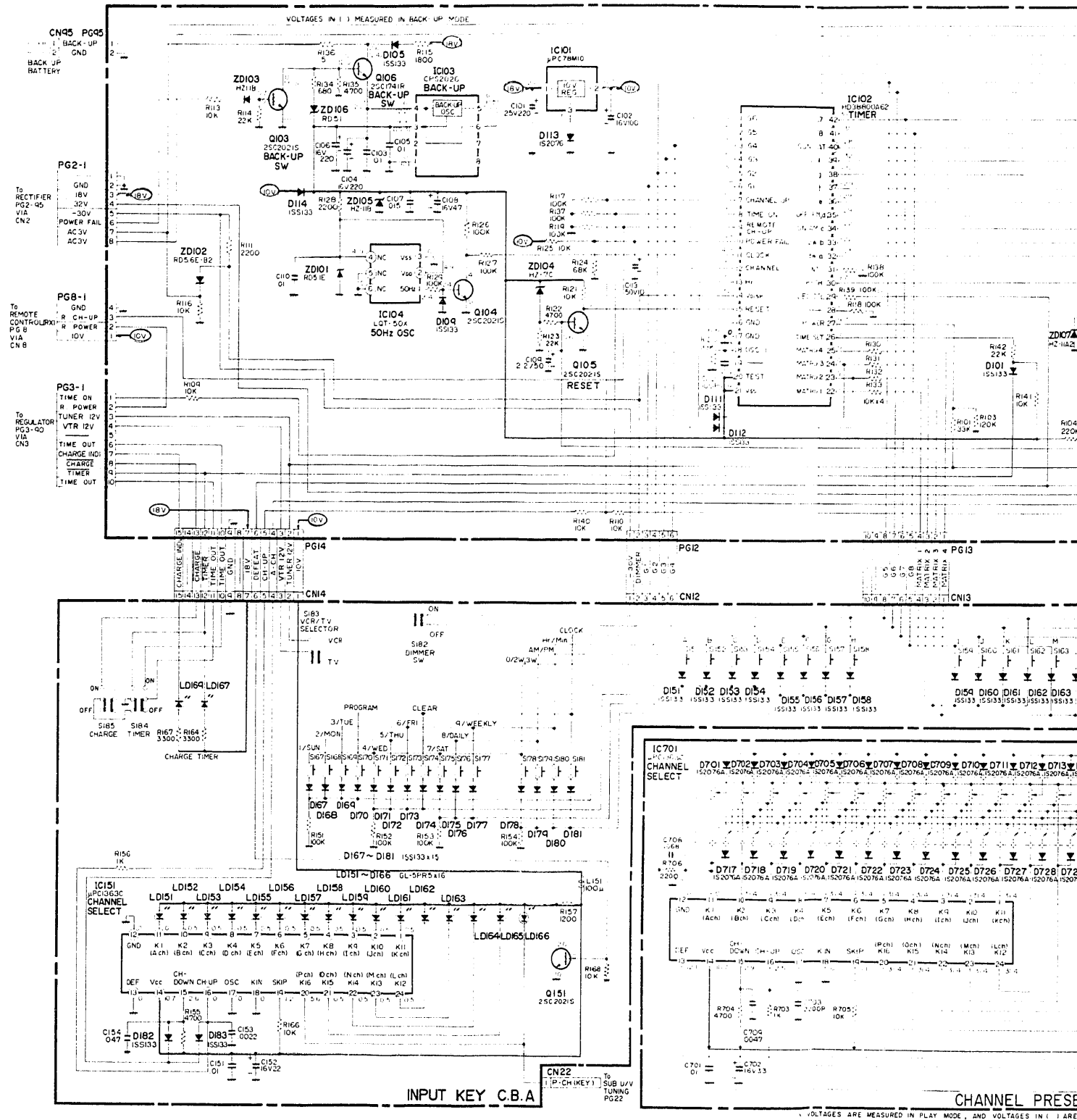
Q909	Q910	Q911
B 0(0.7)	B 0.6(0)	B 0(0.7)
C 16.6(0)	C 0(13.4)	C 10(0)
E 0(0)	E 0(0)	E 2.3(0)

Q912	Q915	Q916
B 0.7(0.3)	B 12.0(15.5)	B 0.7(0)
C 0(15.1)	C 12.6(0)	C 0.1(15.2)
E 0(0)	E 12.8(15.5)	E 0(0)

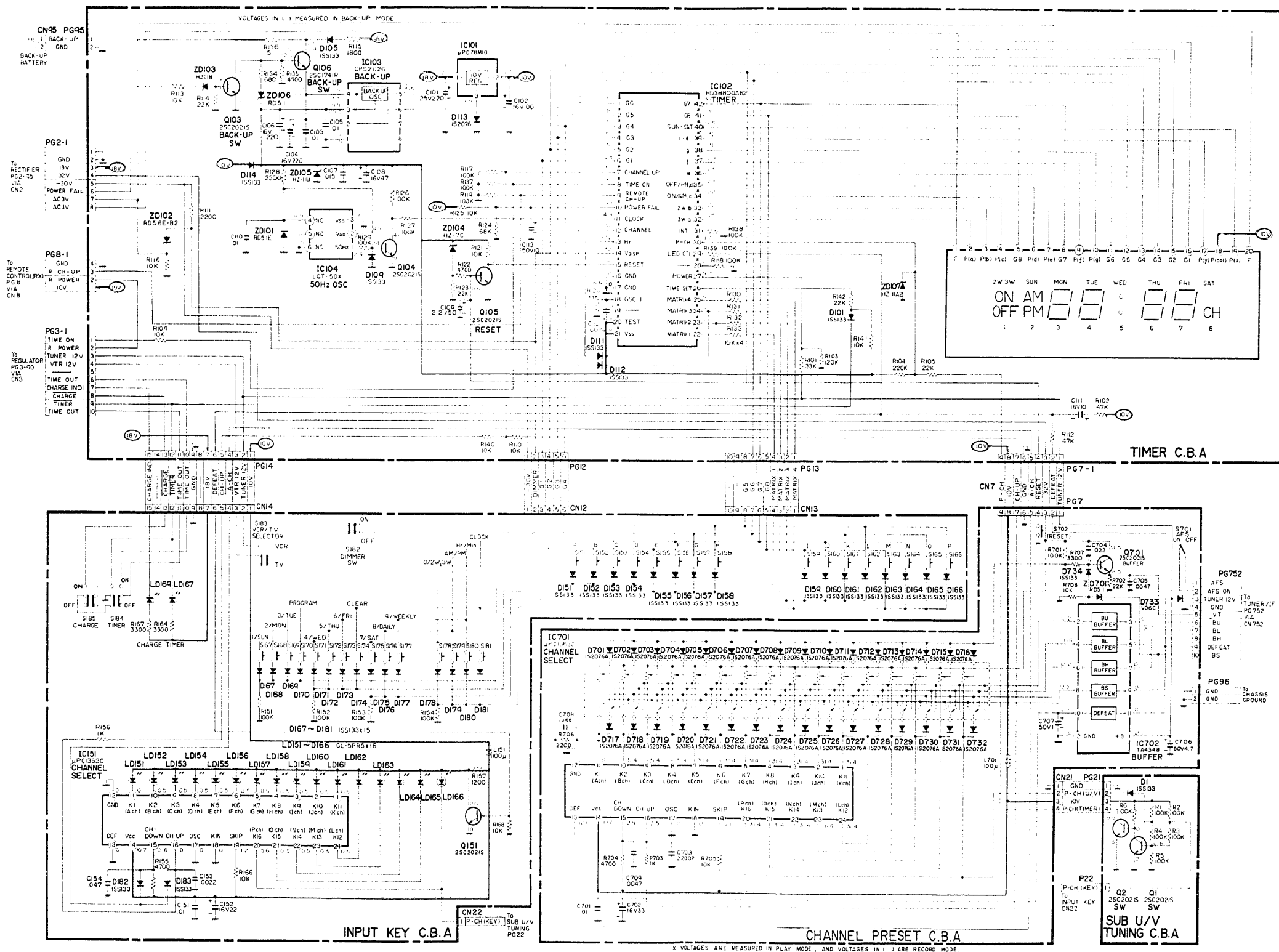
Q917	Q918
B 0.7(0.7)	B 9.6(0)
C 0(0)	C 0(0)
E 0(0)	E 12.0(0)

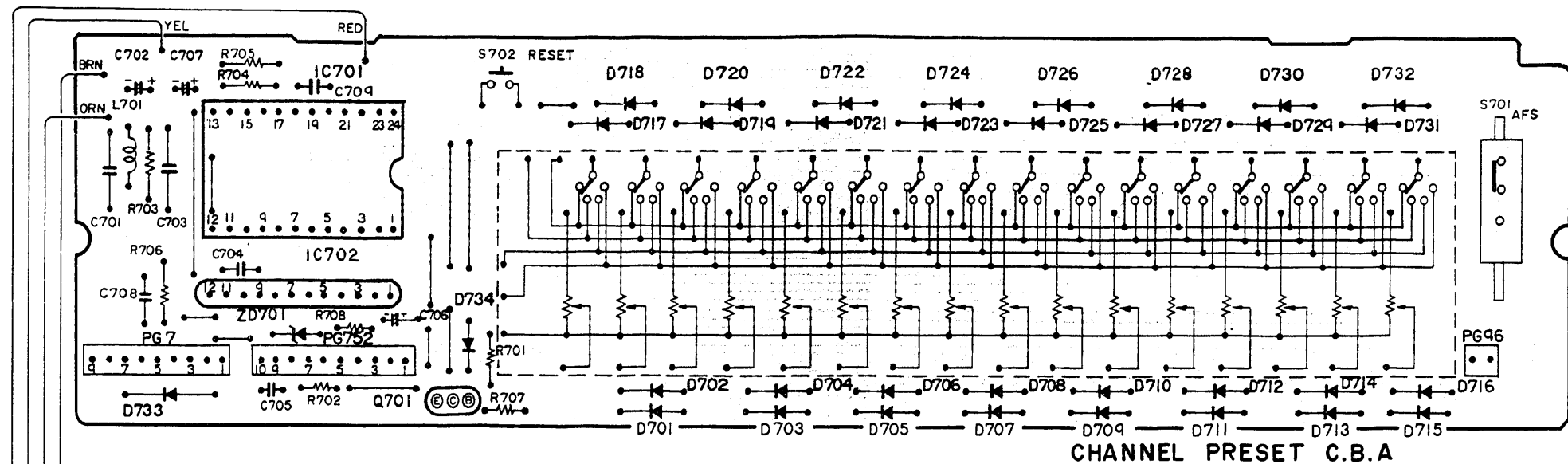
* VOLTAGES ARE MEASURED IN ADAPTER MODE, AND VOLTAGES IN () ARE CHARGE MODE.

TIMER, INPUT KEY, CHANNEL PRESET, SUB U/V TUNING



U/V TUNING





CN21			
1	GND		
2	P-CH(U/V)		
3	10V		
4	P-CH(TIMER)		

To
SUB U/V
TUNING
PG21

PG7			
9	P-CH		
8	10V		
7	CH-UP		
6	GND		
5	A-CH		
4	RESET		
3	32V		
2	DEFEAT		
1	TUNER 12V		

To
TIMER
PG7-1
VIA
CN7

PG752			
1	AFS		
2	AFS ON		
3	TUNER 12V		
4	GND		
5	VT		
6	BU		
7	BL		
8	BH		
9	DEFEAT		
10	BS		

To
TUNER/IF
PG752
VIA
CN752

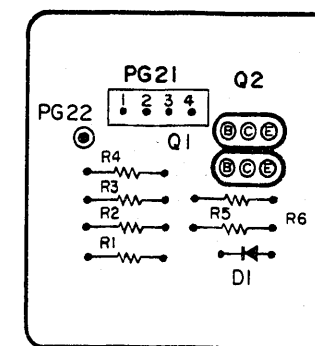
PG96	
1	GND
2	GND

To
CHASSIS
GROUND
CN96

IC701												
13	14	15	16	17	18	19	20	21	22	23	24	
12.1	10.7	2.9	2.5	0	0	1.1	31.4	31.4	31.4	31.4	31.4	
12	11	10	9	8	7	6	5	4	3	2	1	
0	0	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	

IC702											
12	11	10	9	8	7	6	5	4	3	2	1
0	0	12.1	0	12.2	0	12.2	12.1	0.6	0	12.2	12.2

Q701	
B	9.1
C	31.5
E	8.5



SUB U/V C.B.A

PG21			
1	GND		
2	P-CH(U/V)		
3	10V		
4	P-CH(TIMER)		

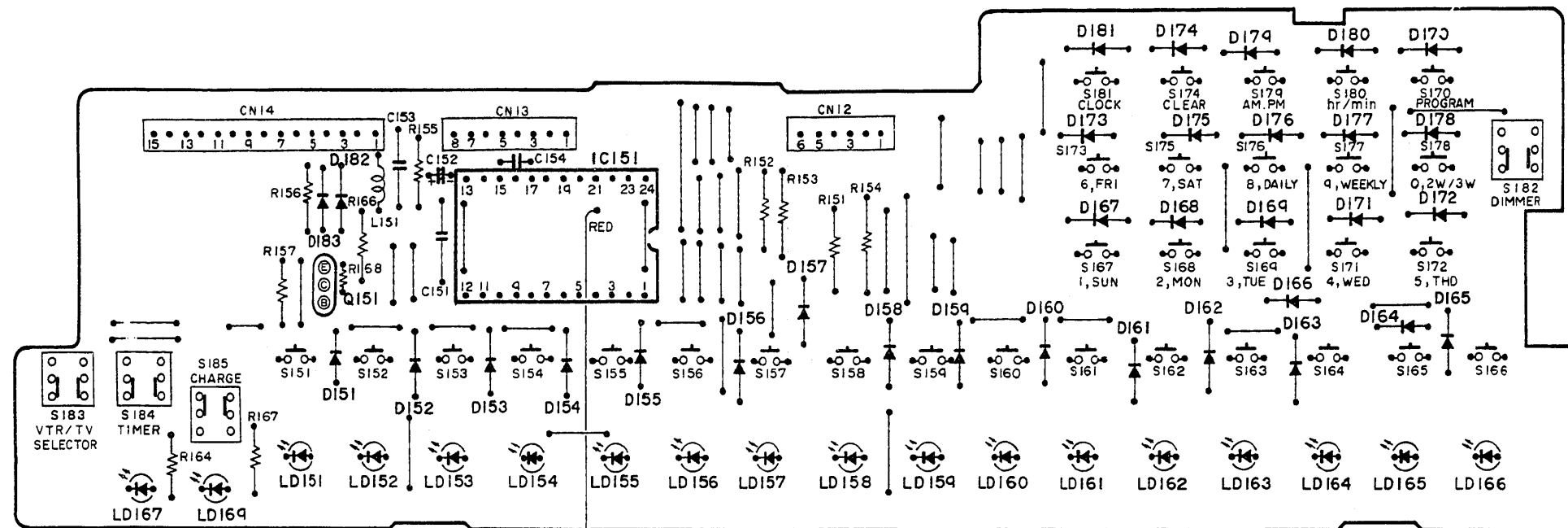
To
CHANNEL
PRESET
CN21

PG22	
1	P-CH(KEY)

To
INPUT KEY
CN22

Q1	
B	0.6
C	0
E	0

Q2	
B	0
C	9.9
E	0



INPUT KEY C.B.A

CN14	
15	CHARGE INDI.
14	—
13	CHARGE
12	TIMER
11	TIME OUT
10	TIME OUT
9	GND
8	—
7	18V
6	DEFEAT
5	CH-UP
4	A-CH
3	VTR 12V
2	TUNER 12V
1	10V

To
TIMER
PG14

CN13	
10	—
9	—
8	G5
7	G6
6	G7
5	G8
4	MATRIX 1
3	MATRIX 2
2	MATRIX 3
1	MATRIX 4

To
TIMER
PG13

CN12	
6	G4
5	G3
4	G2
3	G1
2	DIMMER
1	-30V

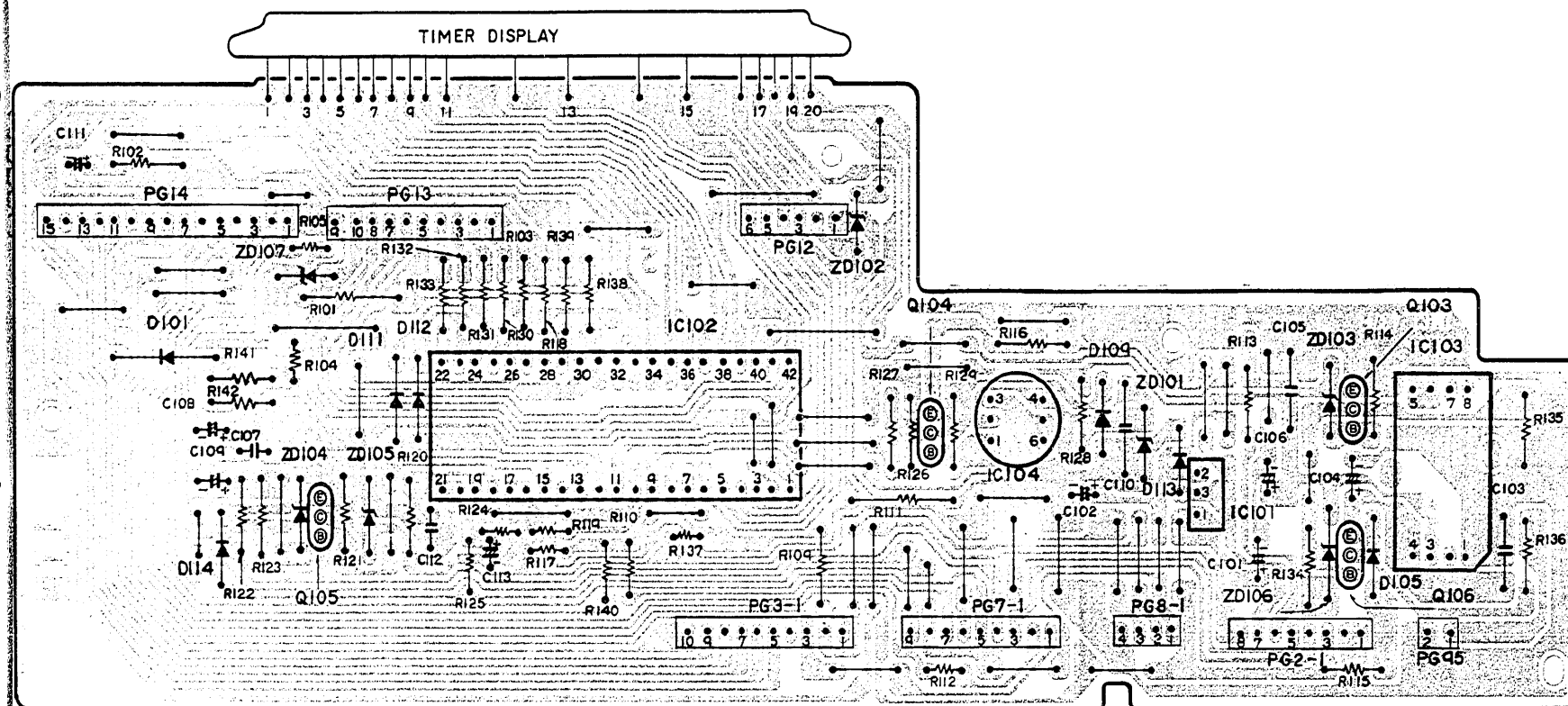
To
TIMER
PG12

CN22	
1	P-CH (KEY)

To
SUB U/V
TUNING
PG12

IC151												
13	14	15	16	17	18	19	20	21	22	23	24	
0	10.7	2.6	0	0	0	1.2	5.6	0.5	0.5	0.5	0.5	
12	11	10	9	8	7	6	5	4	3	2	1	
0	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	

Q151	
B	0
C	2.0
E	0



TIMER C.B.A

IC102															
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
0	0	0	0	0	4.7	0	0	4.7	0	-25	-22	-22	-24	-24	-30
21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6
4.4	4.4	0	6.6	0	0	0	-32	-32	-31	4.8	4.3	0	-30	-30	-28

IC103			
5	6	7	8
0	0	-	-
4	3	2	1
0	4.4	-	0

IC104			
3	0	4	4.4
2	4.4	5	0
1	2.4	6	0

IC101	
2	10.7
3	0.6
1	20

Q103	
B	0.7
C	0
E	0

Q104	
B	2.4
C	4.1
E	0

Q105	
B	0.6
C	0
E	0

Q106	
B	0
C	2.6
E	0

PG14	
15	CHARGE IND.
14	—
13	CHARGE
12	TIMER
11	TIME OUT
10	TIME OUT
9	GND
8	POWER IND.
7	18V
6	DEFEAT
5	CH-UP
4	A-CH
3	VTR 12V
2	TUNER 12V
1	10V

To
INPUT KEY
CN14

PG13	
10	—
9	—
8	G5
7	G6
6	G7
5	G8
4	MATRIX 1
3	MATRIX 2
2	MATRIX 3
1	MATRIX 4

To
INPUT KEY
CN13

PG12	
6	G4
5	G3
4	G2
3	G1
2	DIMMER
1	-30V

To
INPUT KEY
CN12

PG3-1	
1	TIME ON
2	R. POWER
3	TUNER 12V
4	VTR 12V
5	POWER IND.
6	TIME OUT
7	CHARGE IND.
8	CHARGE
9	TIMER
10	TIME OUT

To
REGULATOR
PG3-90
VIA
CN3

PG7-1	
9	P-CH
8	10V
7	CH-UP
6	GND
5	A-CH
4	RESET
3	32V
2	DEFEAT
1	TUNER 12V

To
CHANNEL
PRESET
PG7
VIA
CN7

PG8-1	
4	GND
3	REMOTE CH-UP
2	REMOTE POWER
1	10V

To
REMOTE
CONTROL (RX)
PG8
VIA
CN8

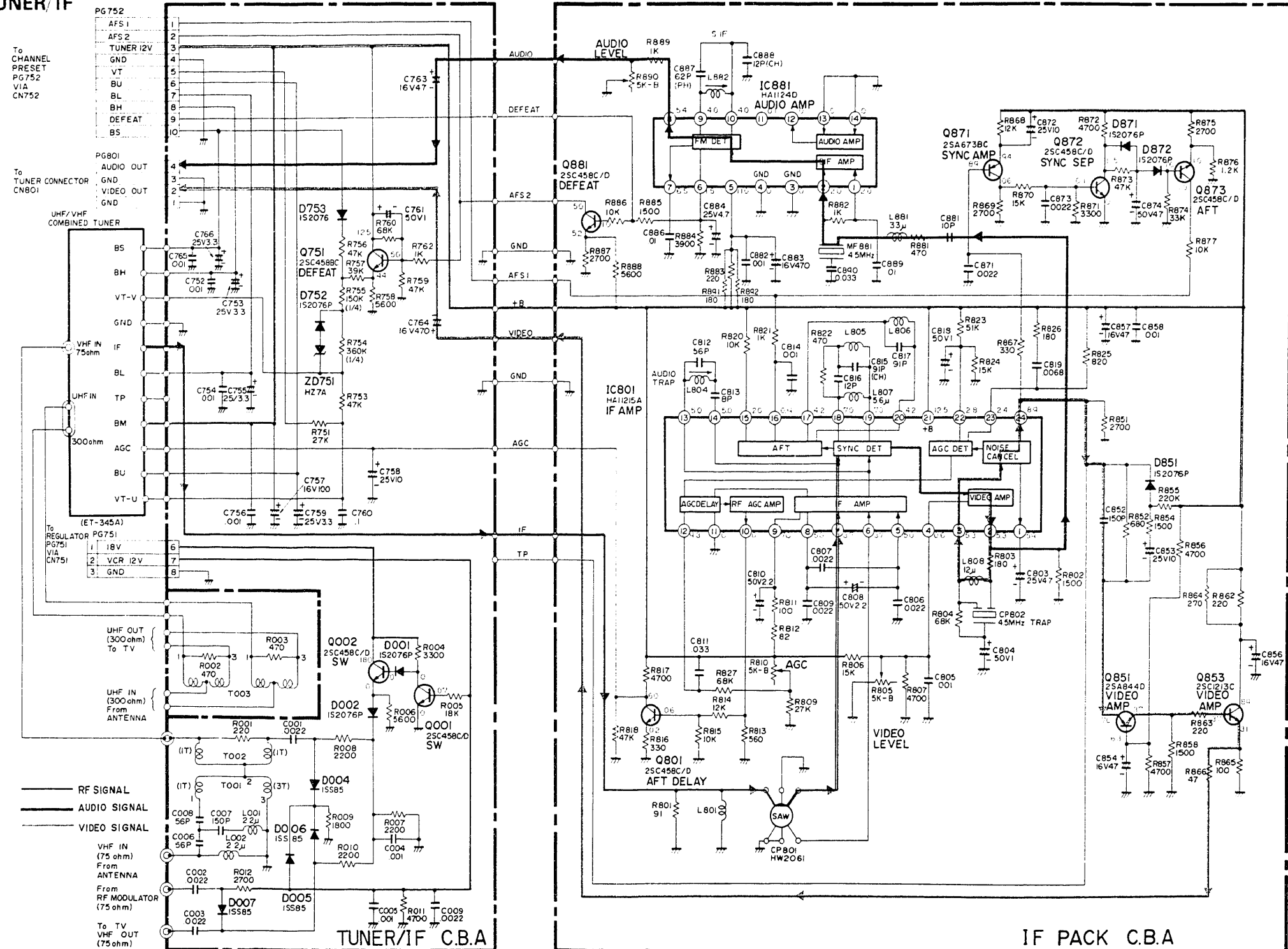
PG2-1	
1	—
2	GND
3	18V
4	32V
5	-30V
6	POWER FAIL
7	AC3V
8	AC3V

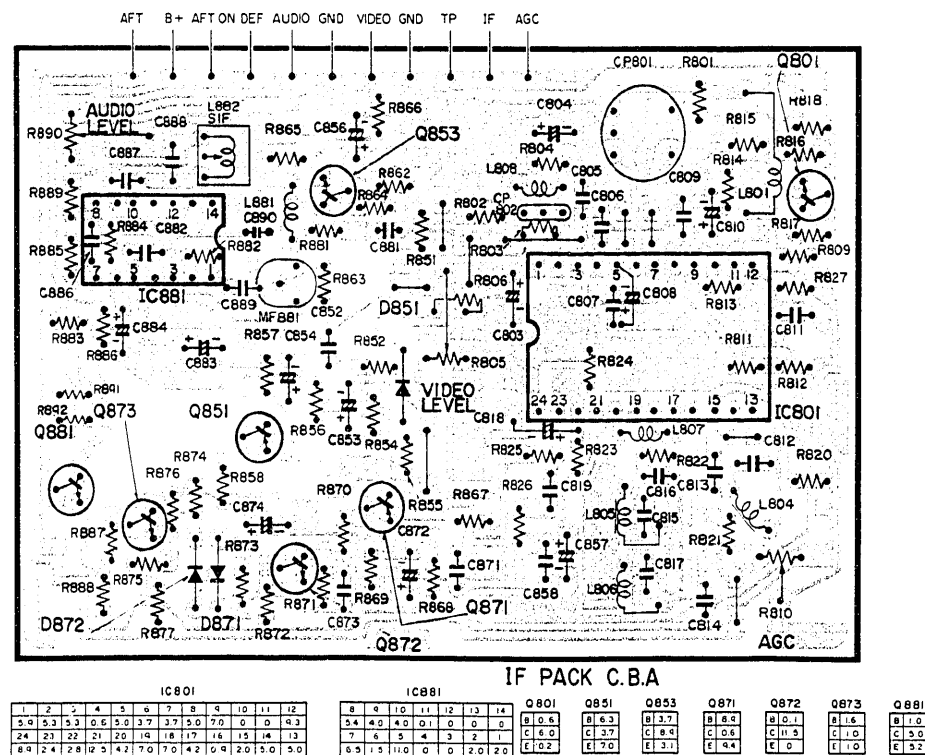
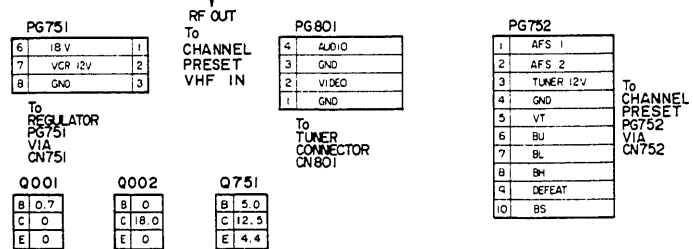
To
RECTIFIER
PG2-95
VIA
CN2

PG45	
1	BACK-UP
2	GND

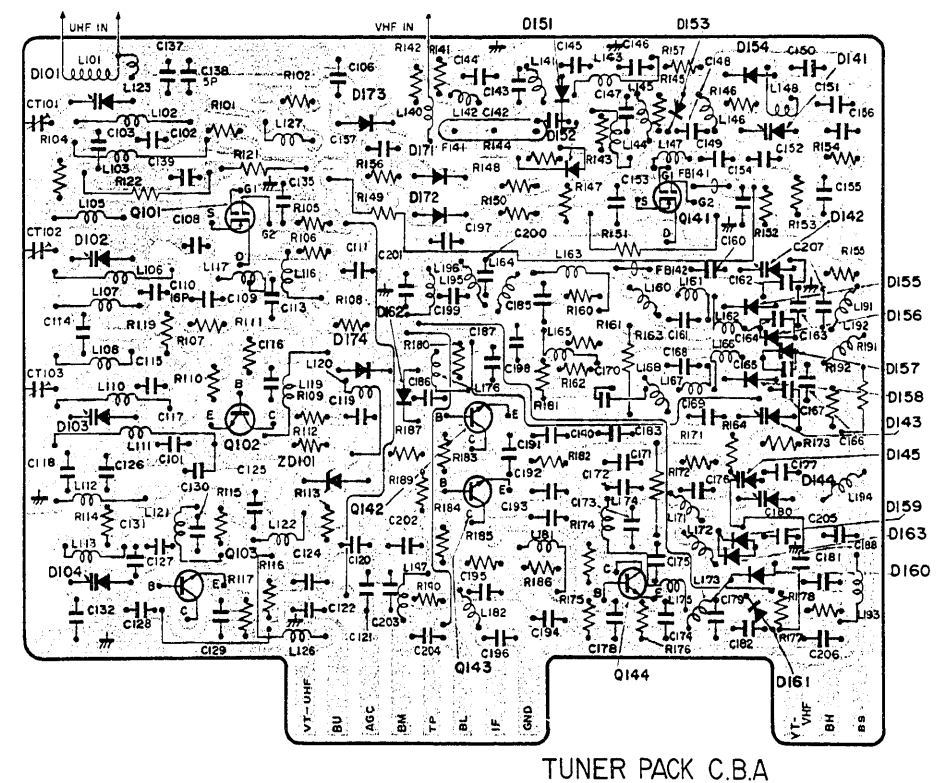
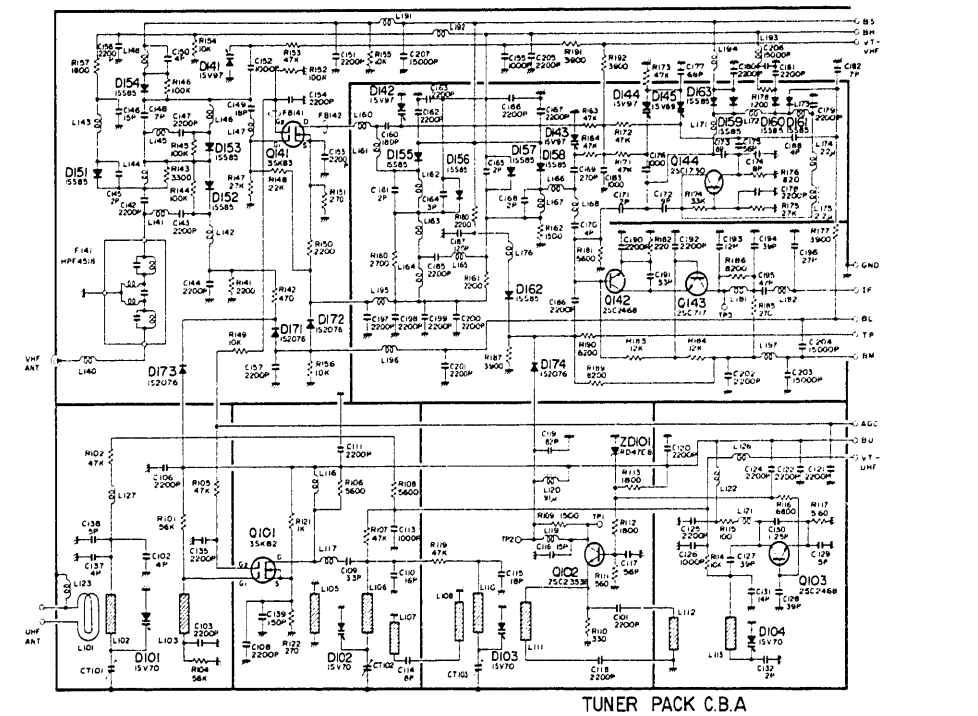
BACK-UP
BATTERY

TUNER/IF

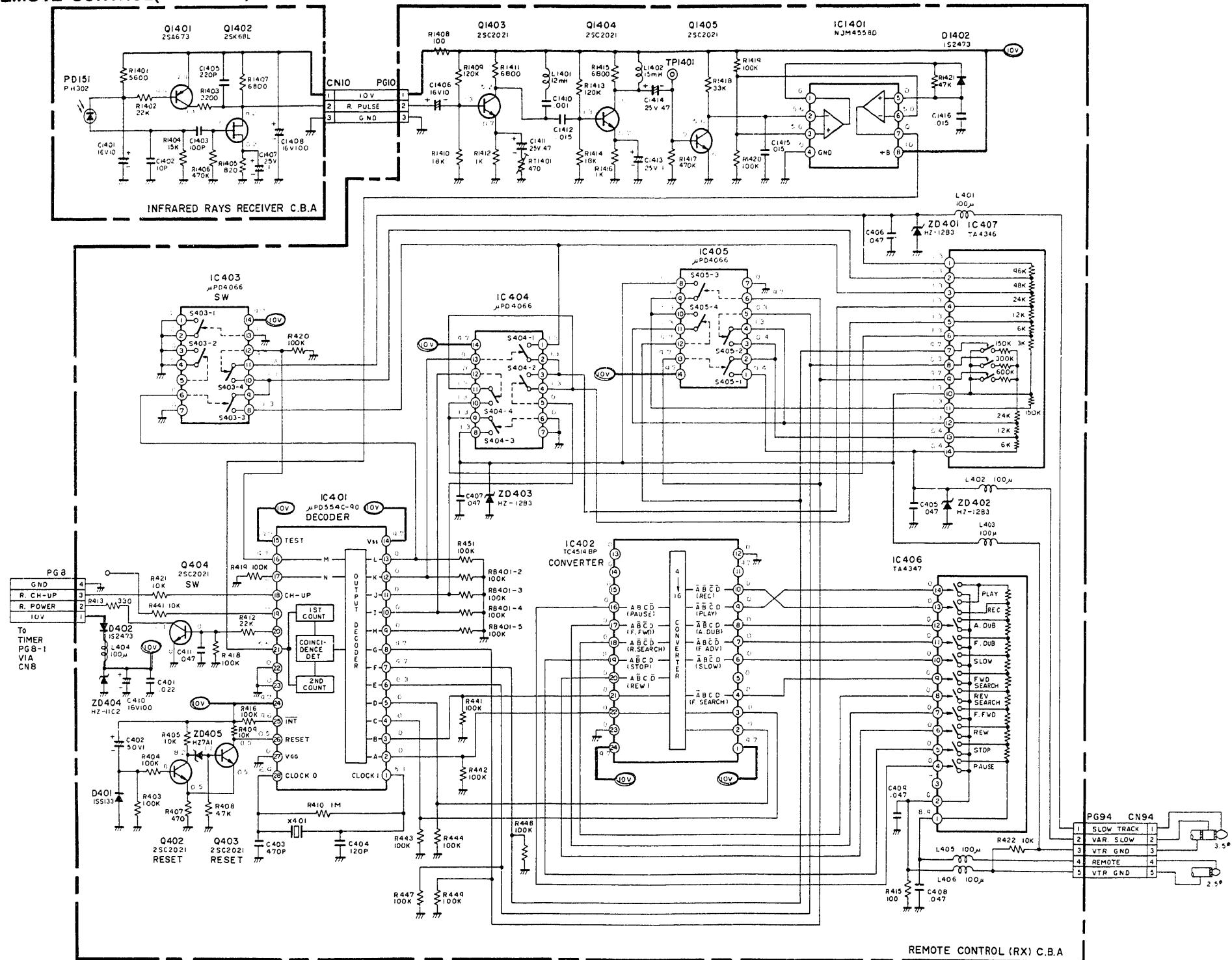


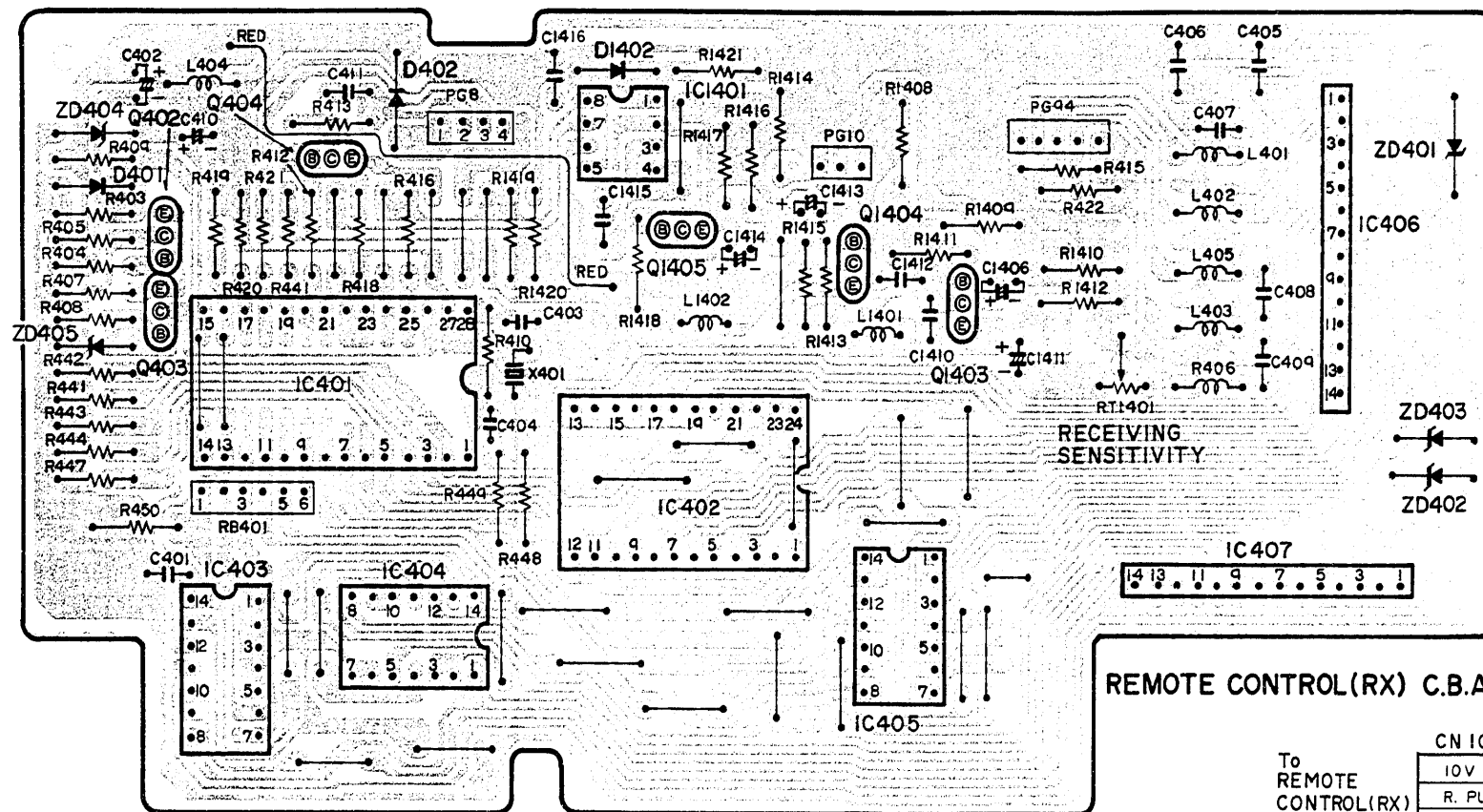


TUNER PACK



REMOTE CONTROL(RECEIVER)





PG8

4	GND	To
3	R. CH-UP	TIMER
2	R. POWER	PG8-1
1	10V	VIA

CN8

PG10

1	10V	To
2	R. PULSE	INFRARED RAYS
3	GND	RECEIVER

CN10

PG94

1	SLOW TRAK.	CN94
2	VAR. SLOW	
3	VCR GND	
4	REMOTE	3.5φ
5	VCR GND	

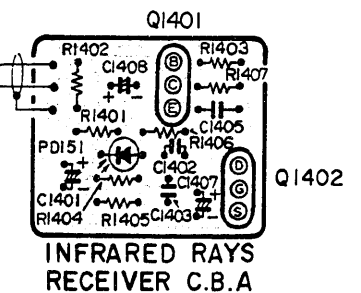
2.5φ

REMOTE CONTROL (RX) C.B.A

To
REMOTE
CONTROL (RX)
PG8

CN10

10V	1
R. PULSE	2
GND	3



IC401

15	16	17	18	19	20	21	22	23	24	25	26	27	28
4.7	4.7	—	—	—	—	5.5	0	0	4.7	4.6	0.5	0	6.4
14	13	12	11	10	9	8	7	6	5	4	3	2	1
4.7	0	0	0	0	0	4.7	4.7	0.3	0	0	0	0	6.1

IC404

8	9	10	11	12	13	14
1.3	1.3	1.3	1.3	0	0	4.7
7	6	5	4	3	2	1
0	0	0	1.3	1.3	1.3	1.3

IC406

1	8.9
2	0
3	—
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0

IC1401

8	10	1	0
7	0	2	5.6
6	5.0	3	5.0
3	0	4	0

IC402

13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	4.7
12	11	10	9	8	7	6	5	4	3	2	1
0	4.7	0	0	0	0	0	0	0	0	0	4.7

IC403

14	4.7	1	0
13	0	2	0
12	4.7	3	0
11	1.3	4	0
10	1.3	5	—
9	1.3	6	0
8	1.3	7	0

IC405

14	4.7	1	0.4
13	4.7	2	0.4
12	4.7	3	0.4
11	1.3	4	1.3
10	1.3	5	0.3
9	1.3	6	4.7
8	1.3	7	0

Q402

B	0
C	8.2
E	0.5

Q403

B	1.1
C	0.5
E	0.5

Q404

B	0
C	0.1
E	0

Q1401

B	4.4
C	8.3
E	4.4

Q1402

D	8.2
G	0
S	0.2

Q1403

B	1.3
C	5.2
E	0.7

Q1404

B	1.3
C	10
E	0.7

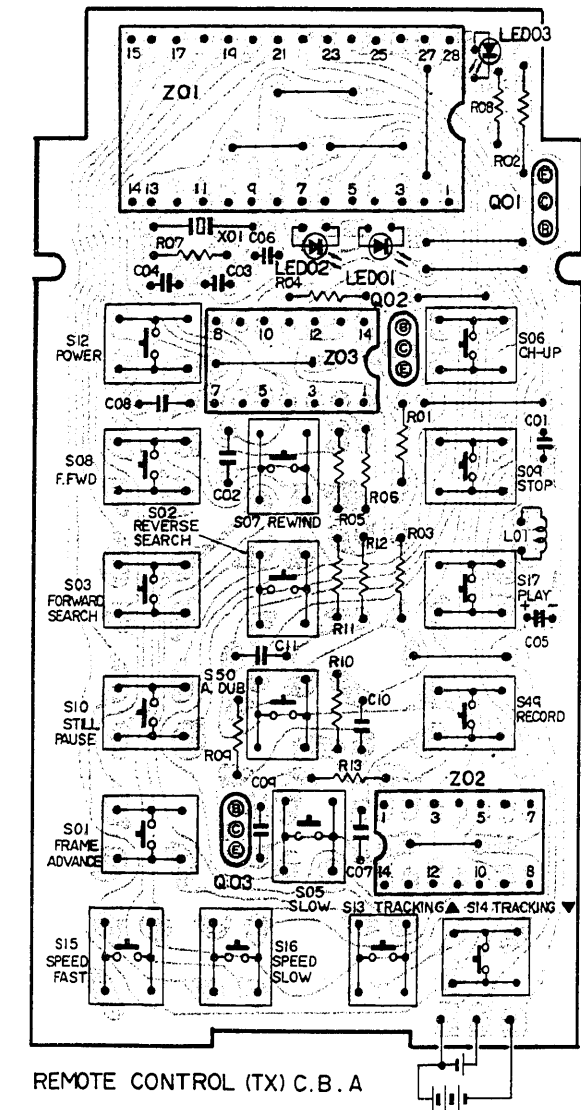
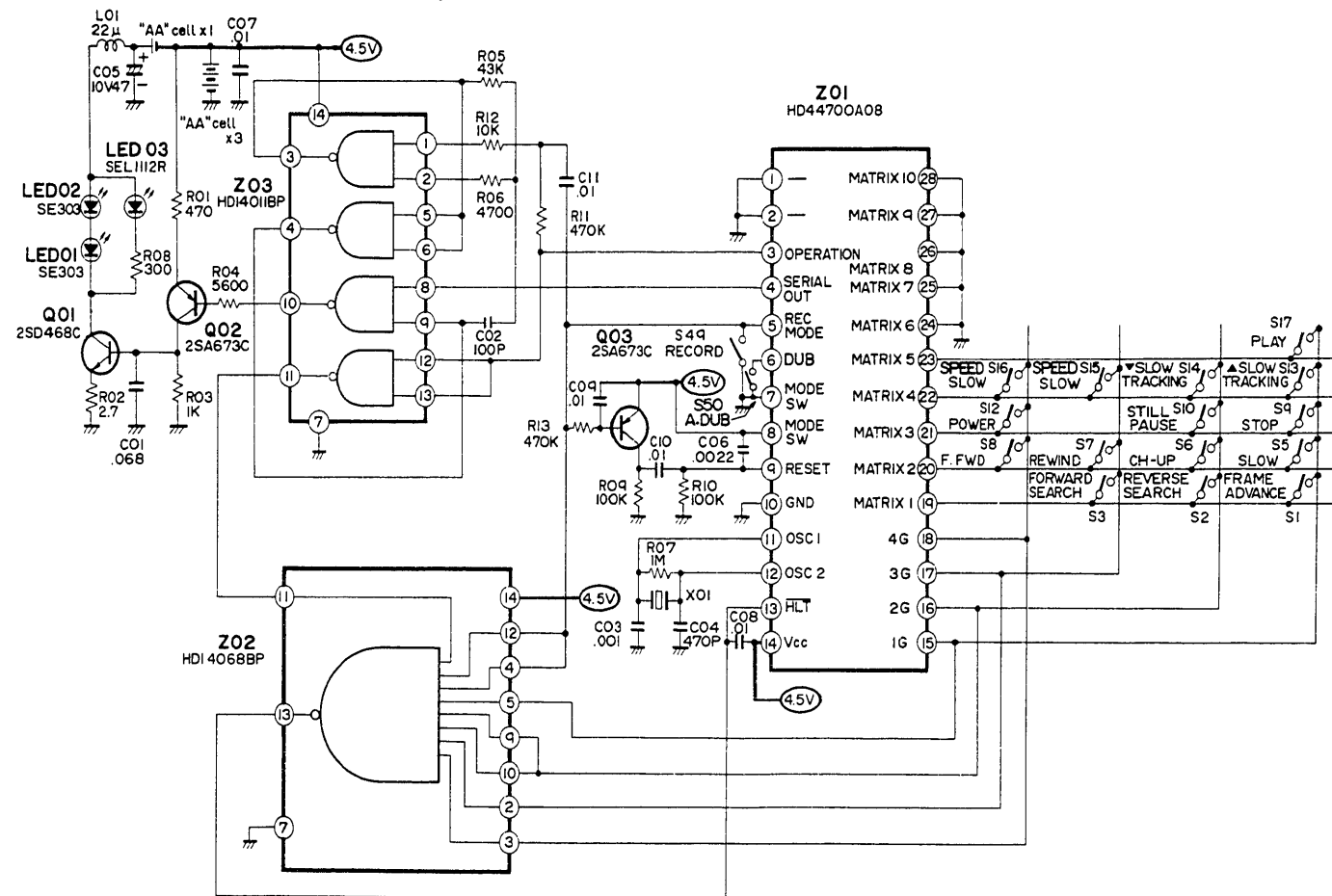
Q1405

B	0
C	5.6
E	0

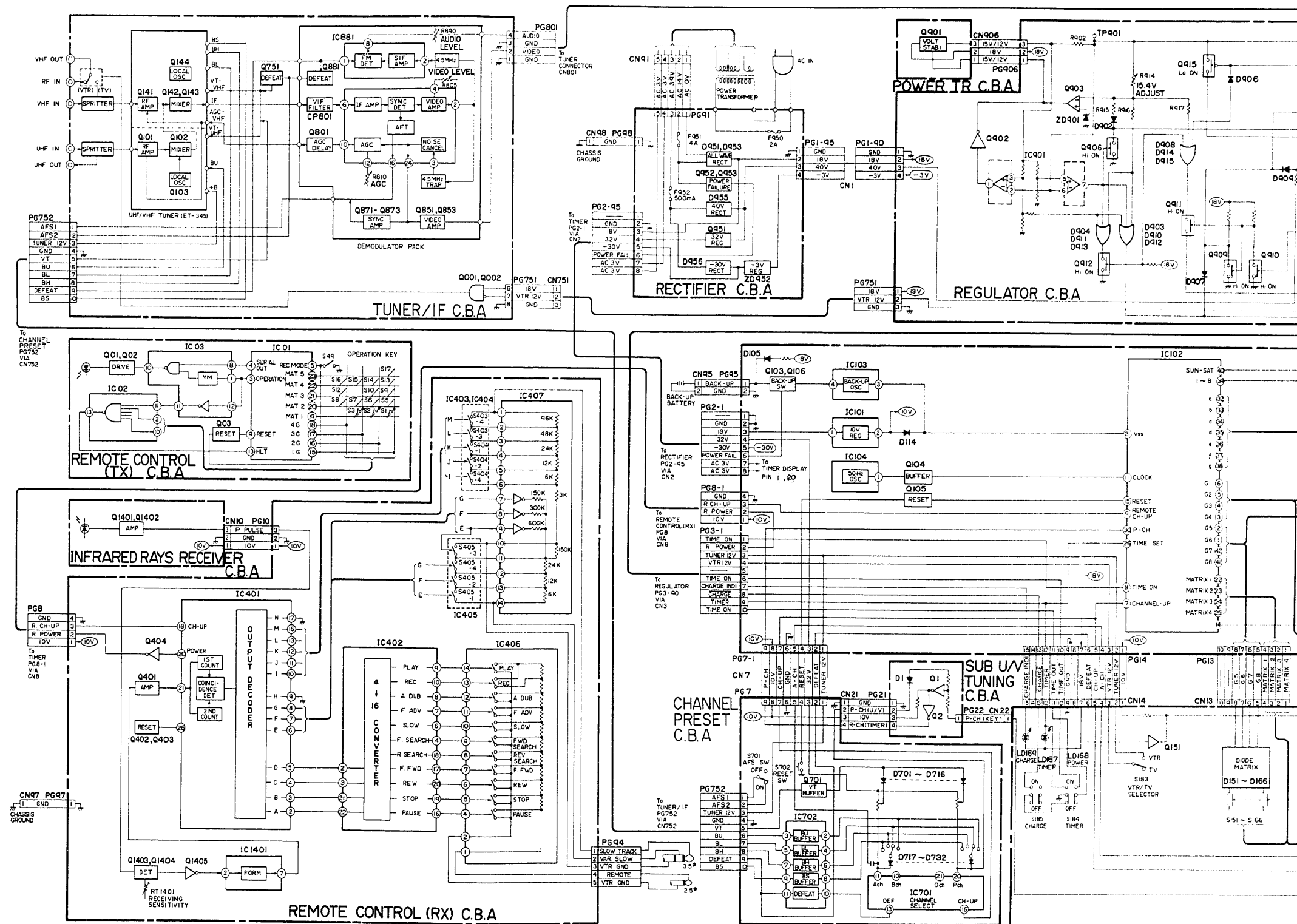
IC407

14	13	12	11	10	9	8	7	6	5	4	3	2	1
0.4	0.4	1.3	1.3	1.3	4.7	0.3	4.7	1.3	1.3	1.3	1.3	1.3	1.3

REMOTE CONTROL (TRANSMITTER)



BLOCK DIAGRAM(VT-TU68A)

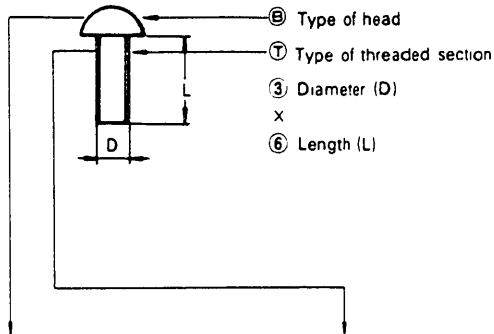




EXPLODED VIEWS

SCREW CLASSIFICATION

Example: 8T3 x 6



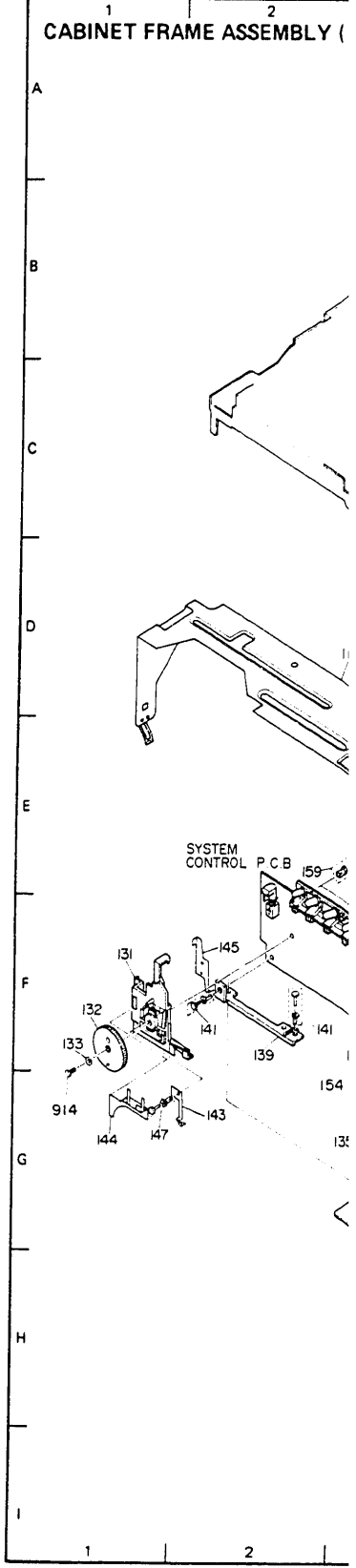
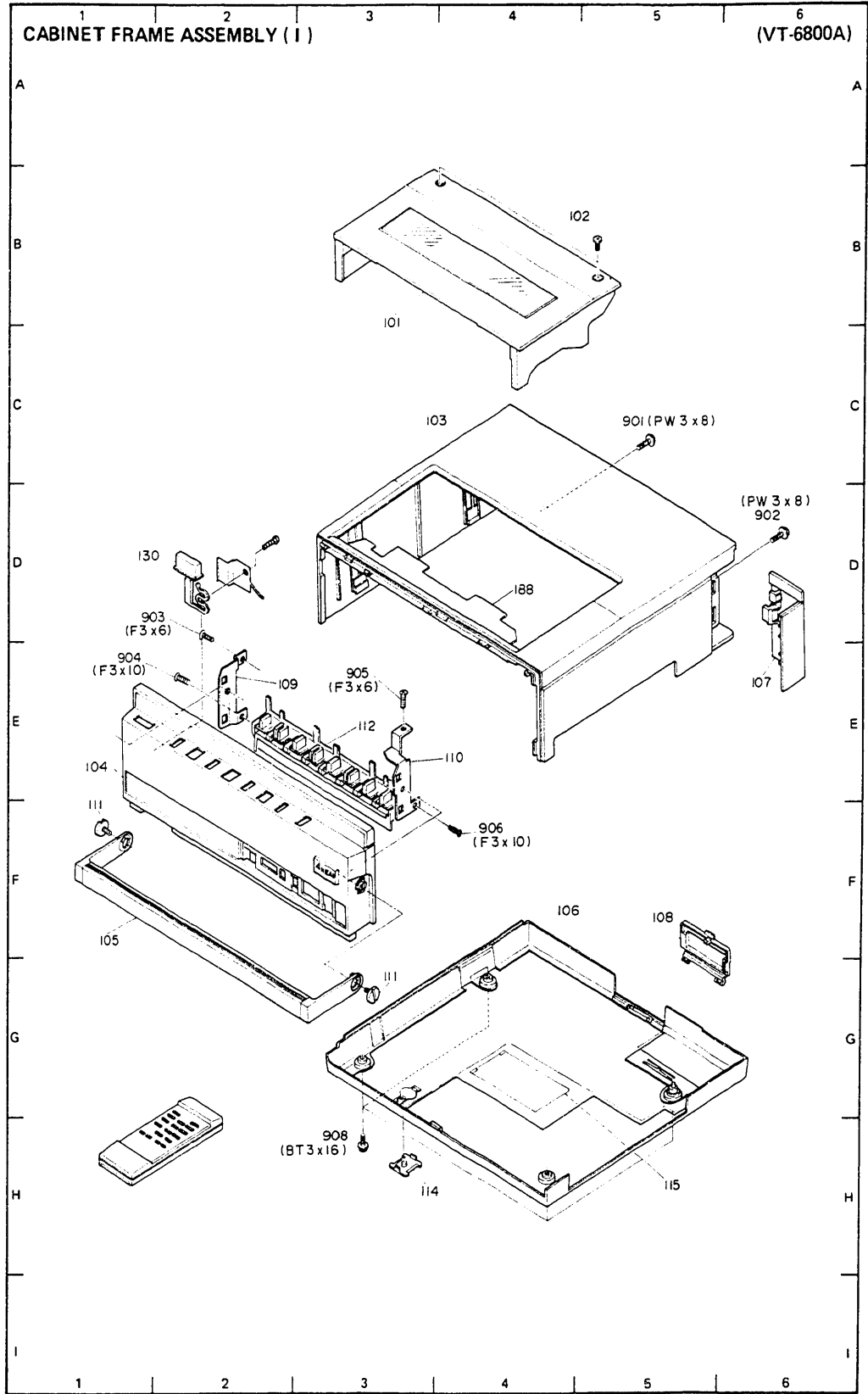
Abbreviation	Name	Shape	Abbreviation	Name	Shape	Abbreviation	Name	Shape
No symbol	Brazier head		No symbol	Machine (clamps without tapping)		W	Washer	
P	Pan head		t	Tapping (clamps with tapping) Type 1		SW	Spring washer	
B	Binding head		r	Tapping (clamps with tapping) Type 2		LW	Locking washer	
O	Oval countersunk head		f	Forming tight (for metal)		E	E-ring	
F	Flat countersunk head		Note: Since the forming tight screw tightens while self-tapping, machine screws can be replaced by tapping screws.			N	Nut	
			Note: Internal dia. is indicated for nuts and washers.					

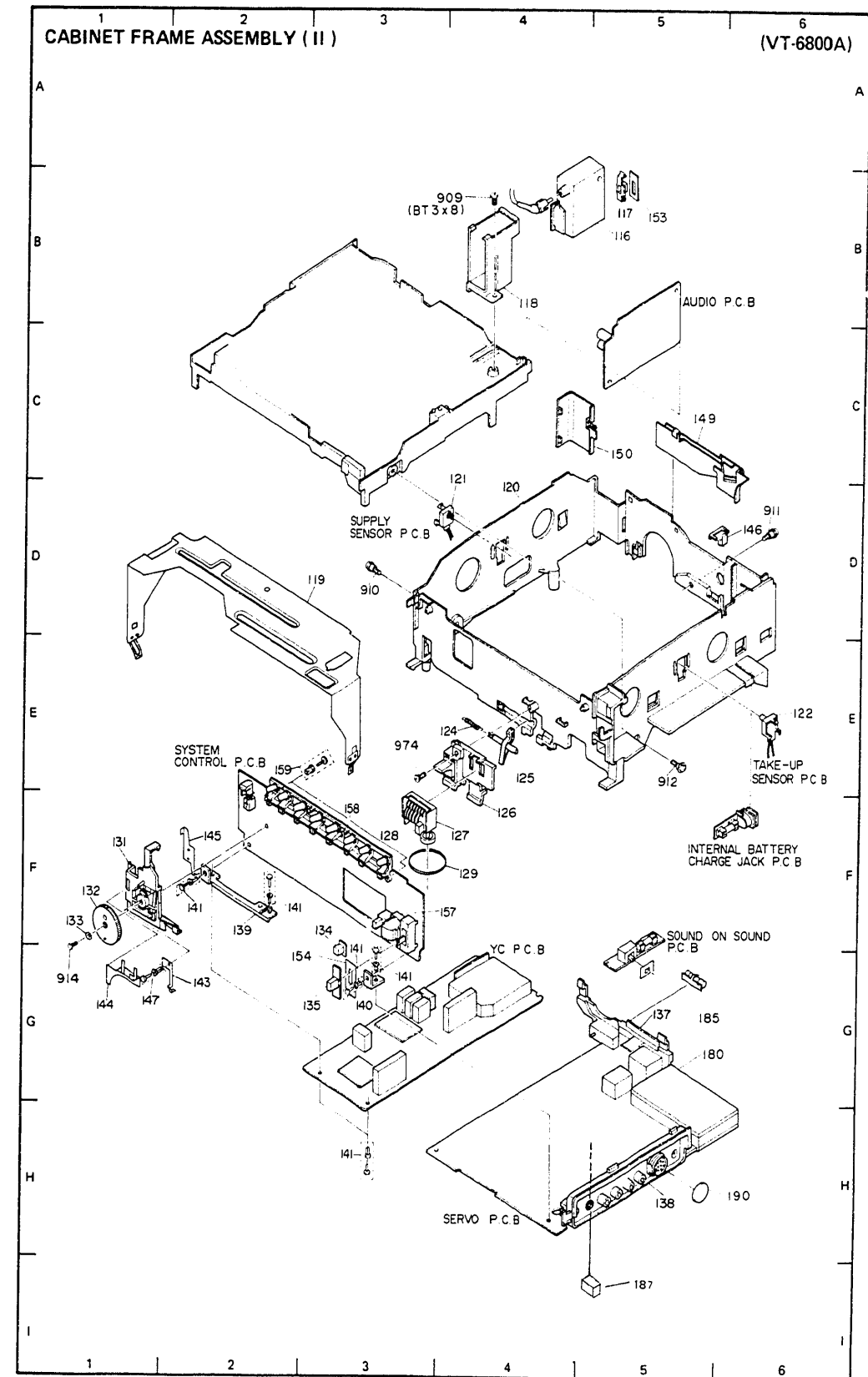
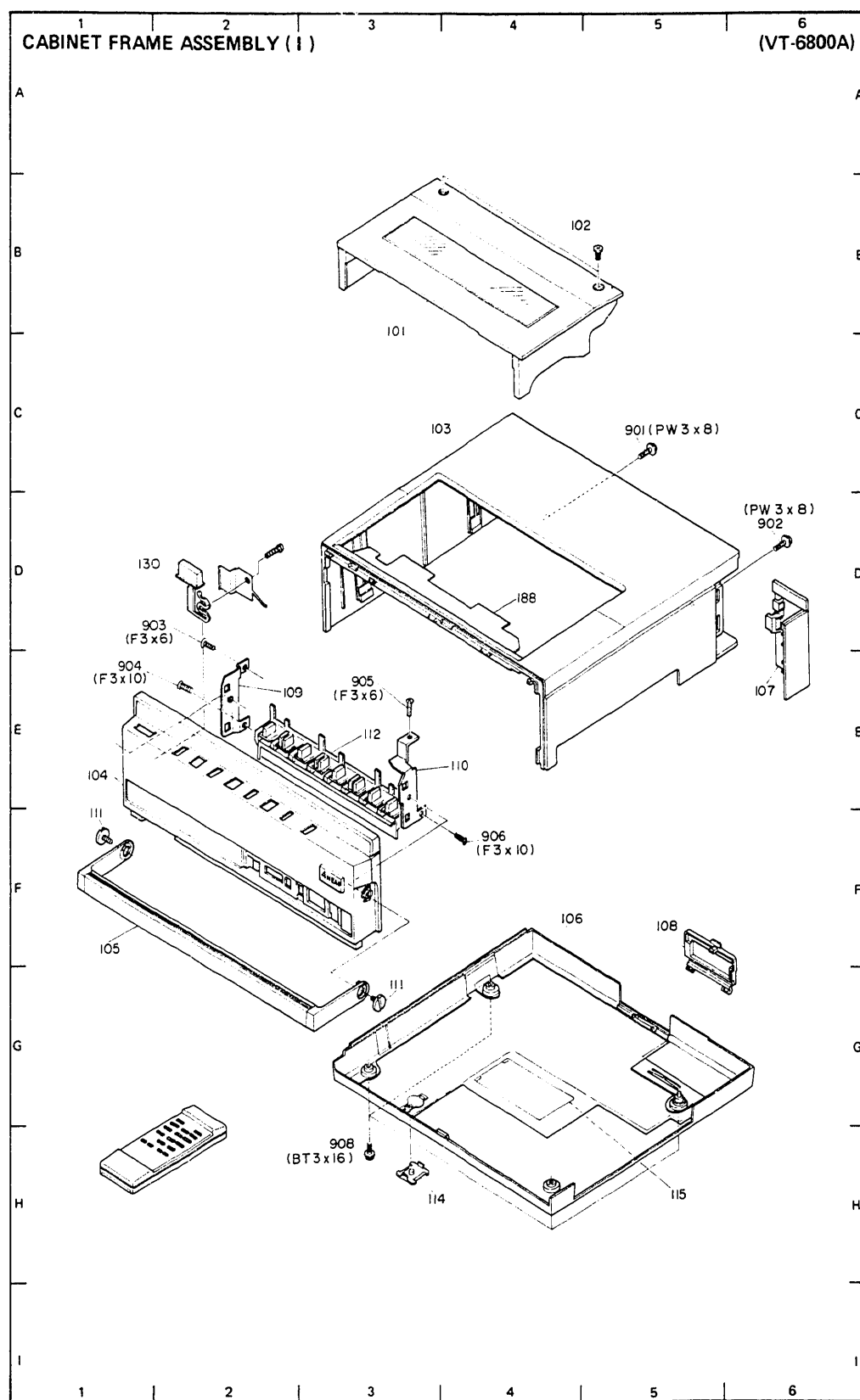
LUBRICATION

Lubrication points are shown in the exploded view diagrams by marks

Lubricants shown in the diagram are as follows

- Ⓟ Pan motor oil (x 10W-40)
- Ⓢ Sonic slider oil (# 1600)
- Ⓢ Silicone grease (KS-64)
- Ⓜ Hitazol (MO-138)
- No symbol Froil (GB-TS-1)

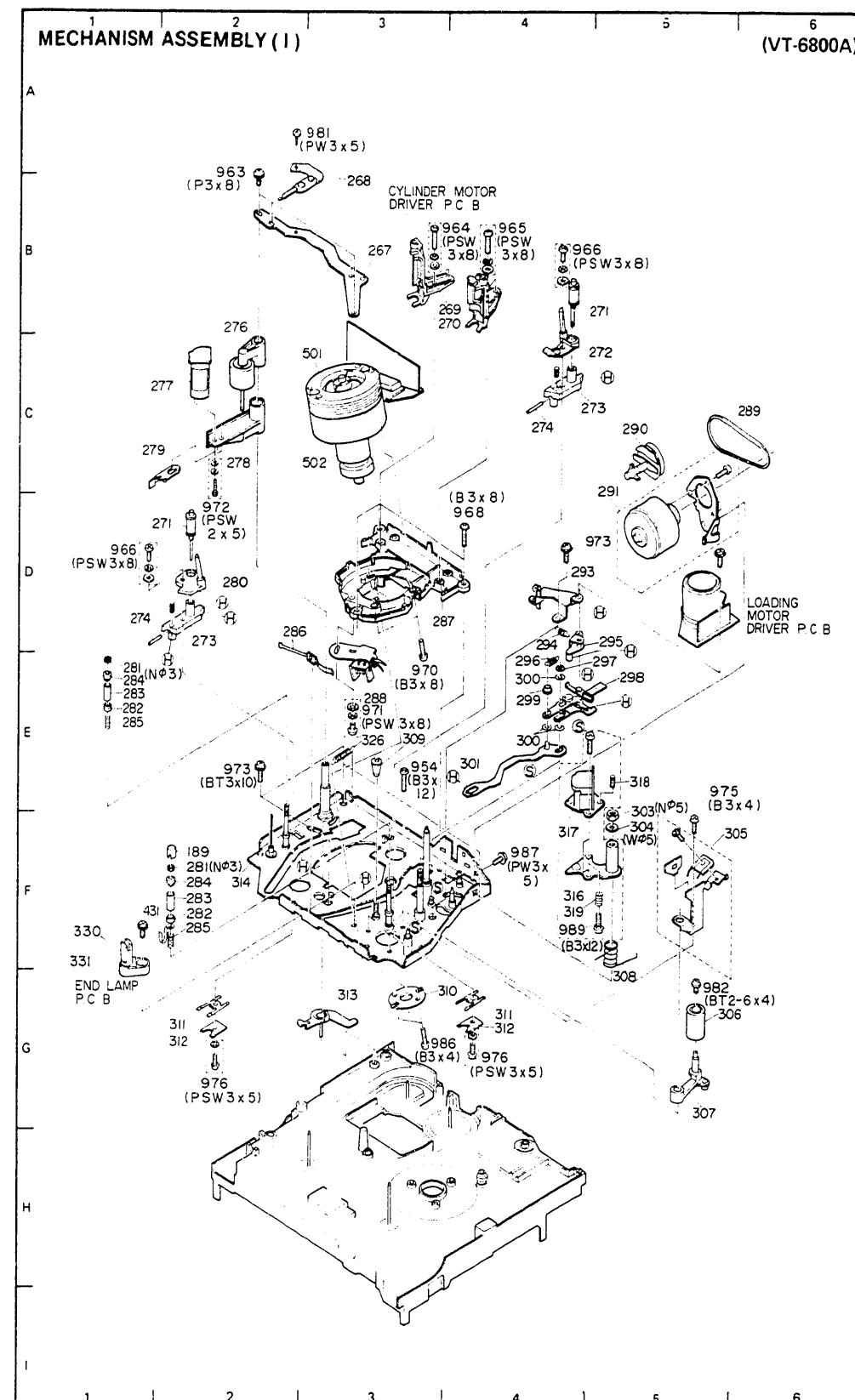
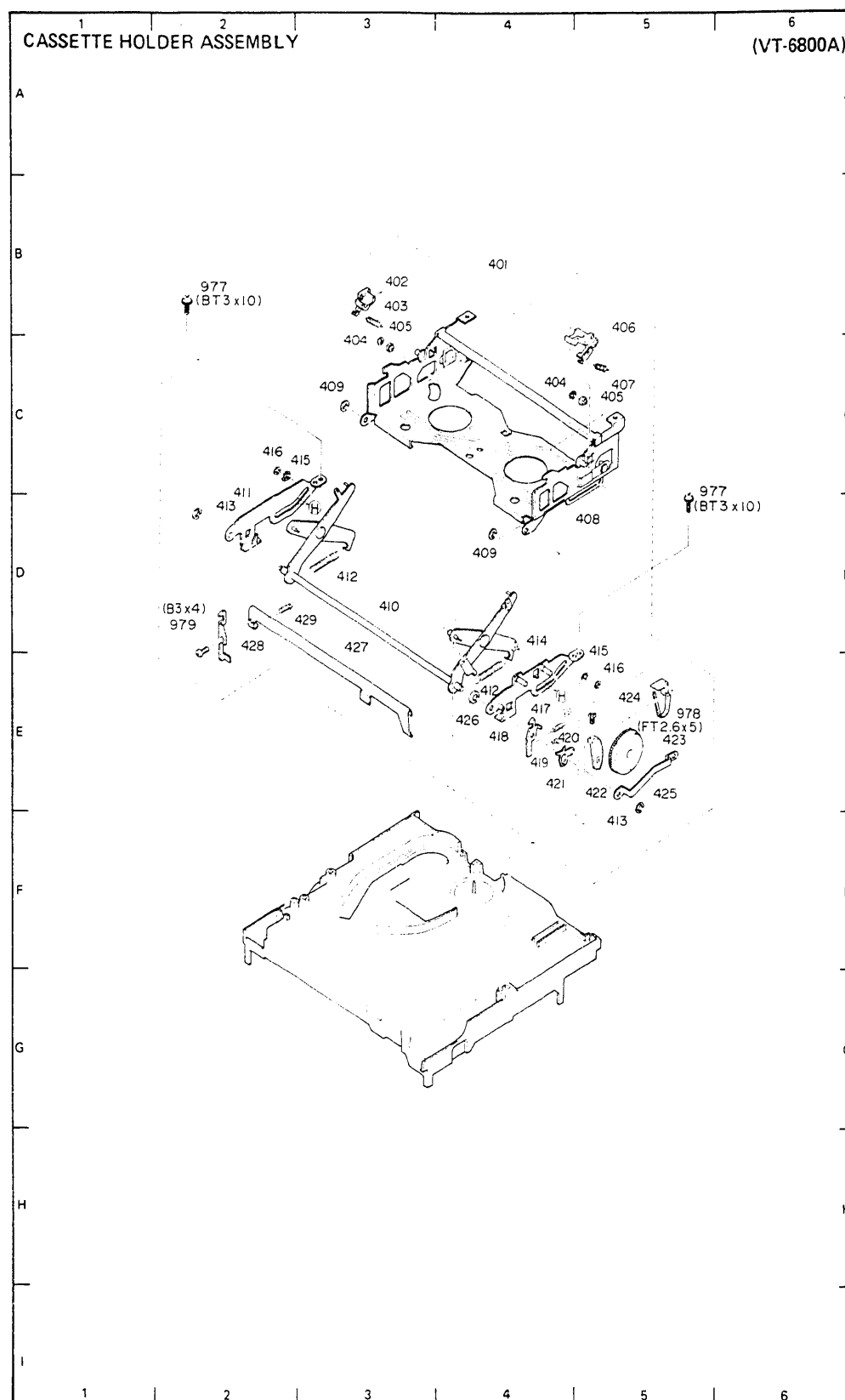




Washers and Nuts

Abbreviation	Name	Shape
W	Washer	
SW	Spring washer	
LW	Locking washer	
E	E ring	
N	Nut	
Note: Internal dia. is indicated for nuts and washers		

oil (x 10W-40)
 oil (# 1600)
 grease (KS-64)
 (10-138)
 oil (GB-TS-1)

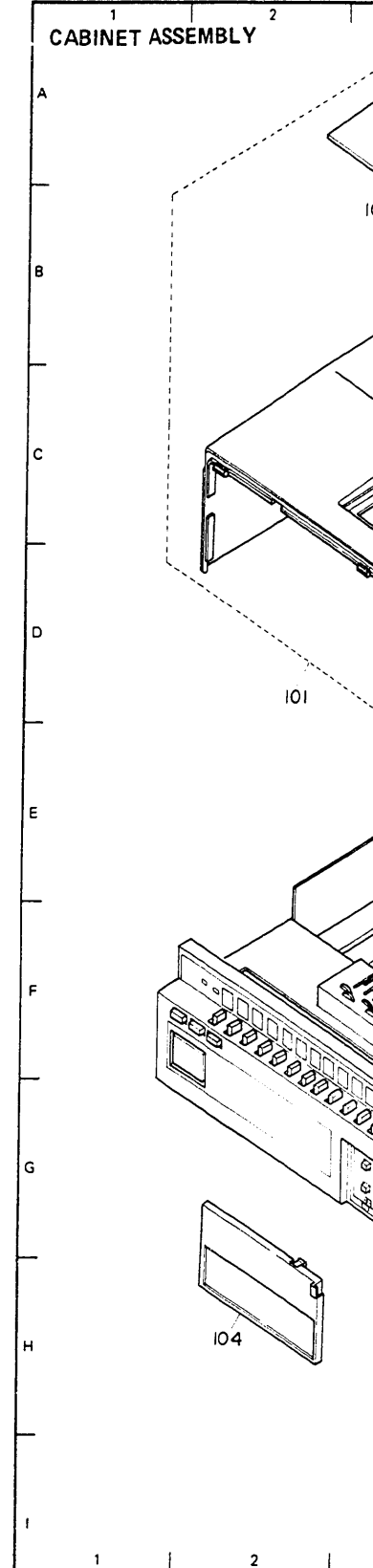
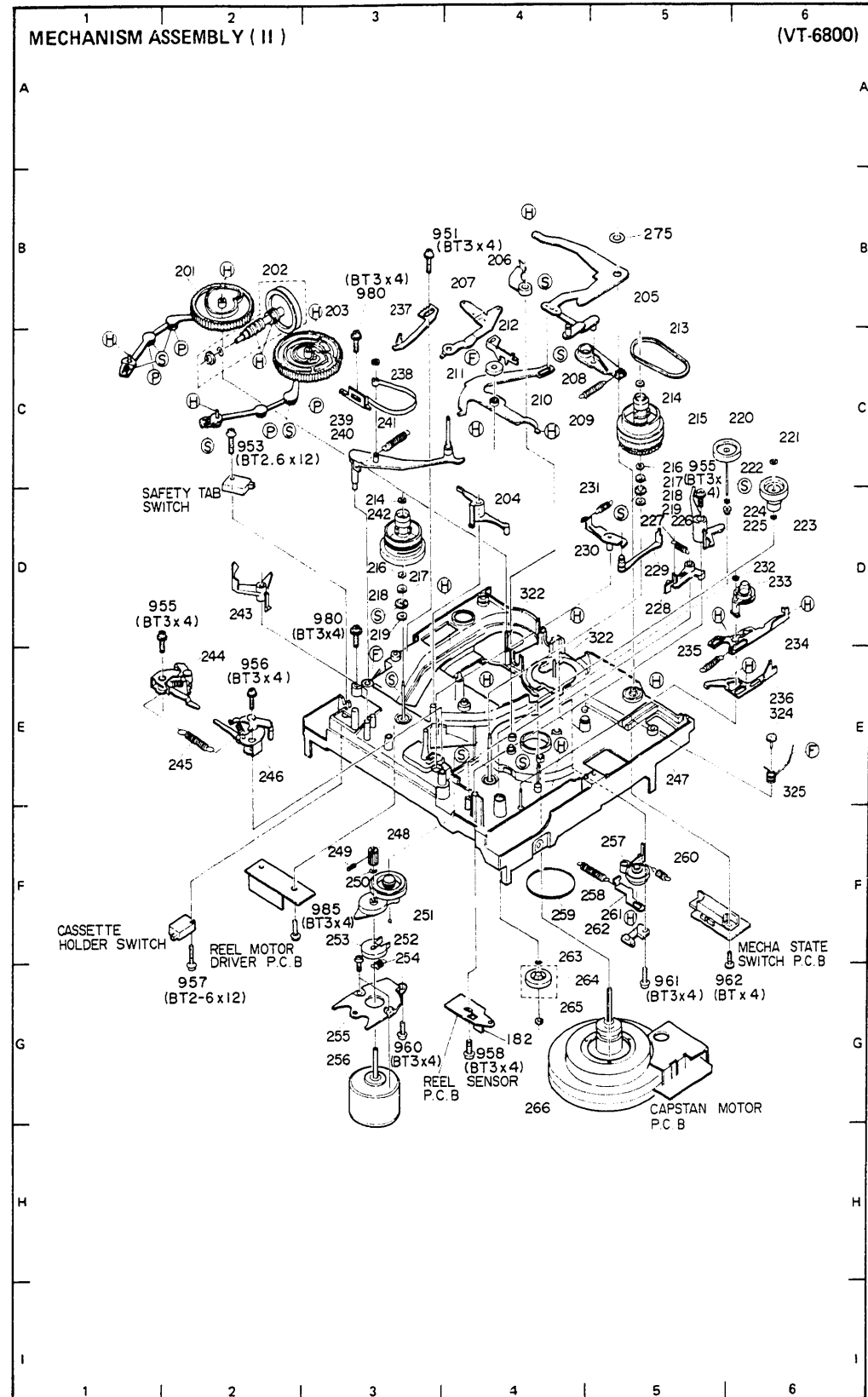
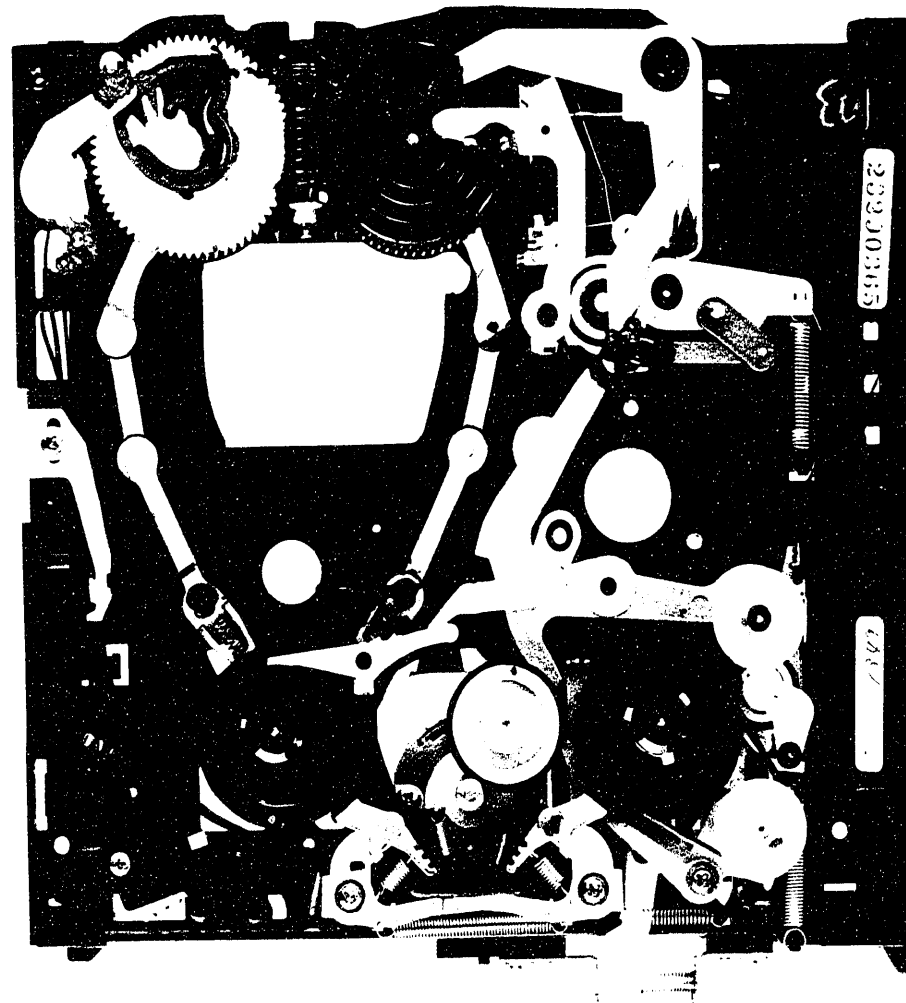


MECHANICAL PARTS LOC

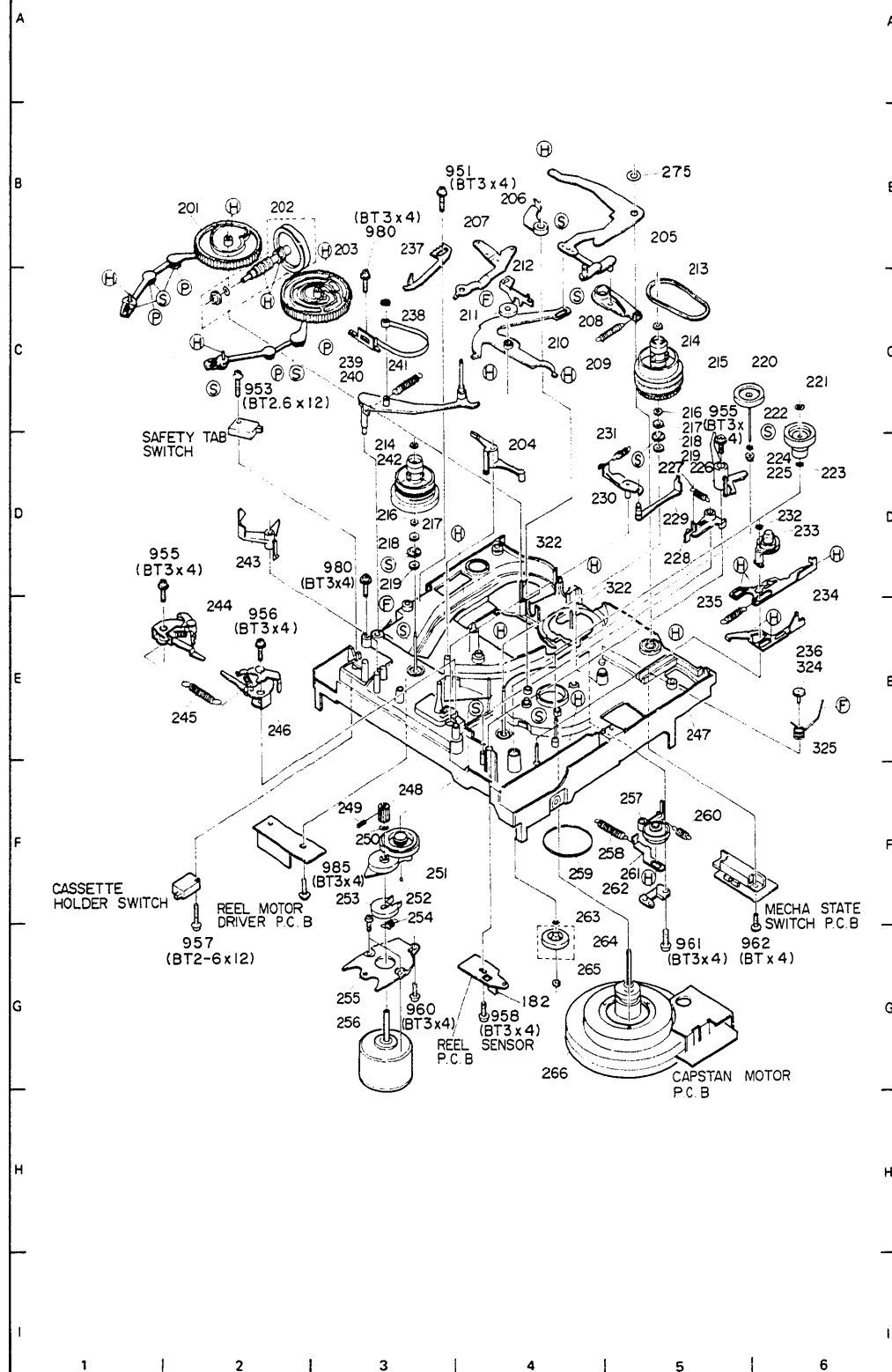


MECHANICAL PARTS LOCATION (II)

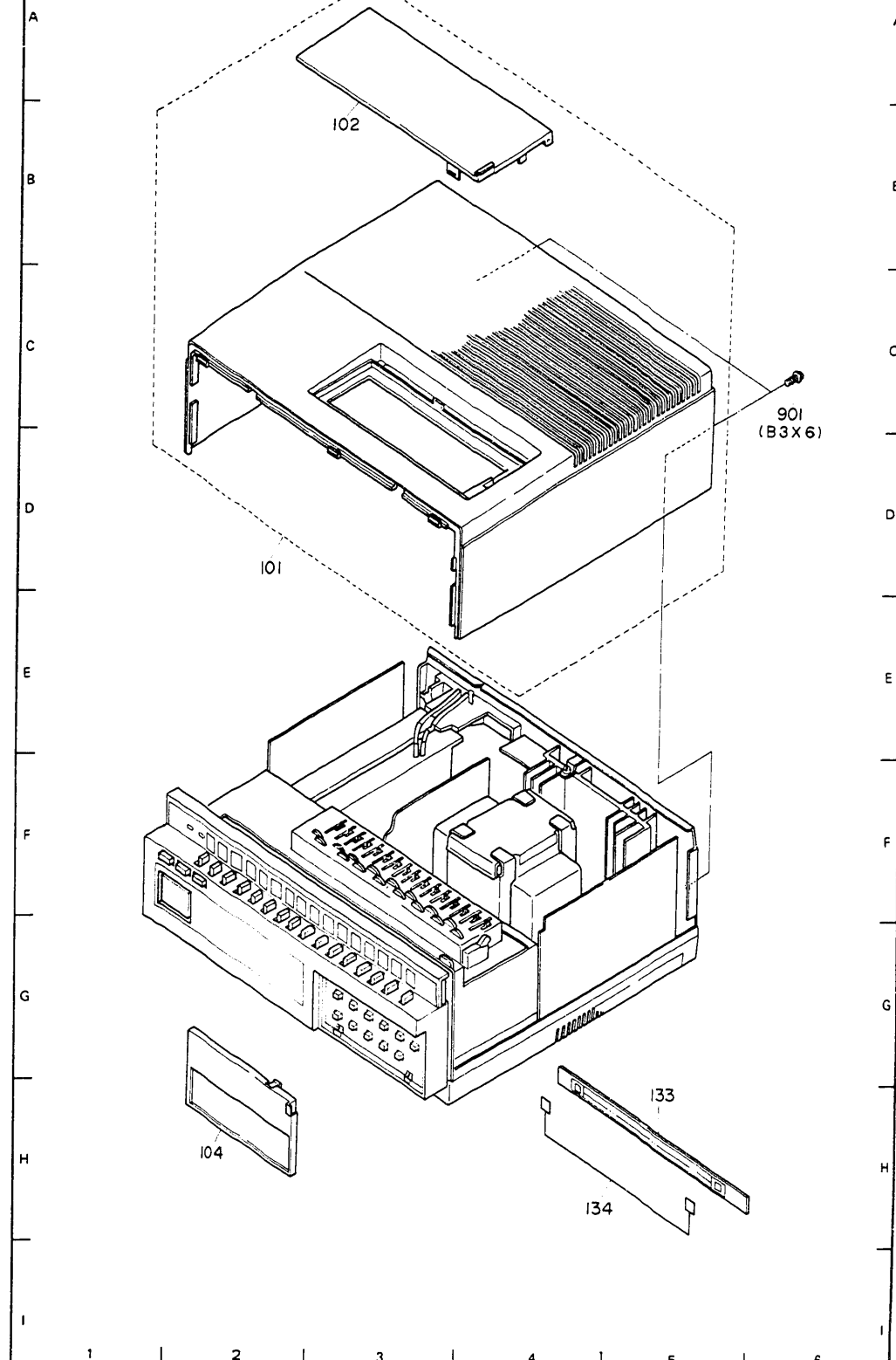
(VT-6800A)



(VT-6800)

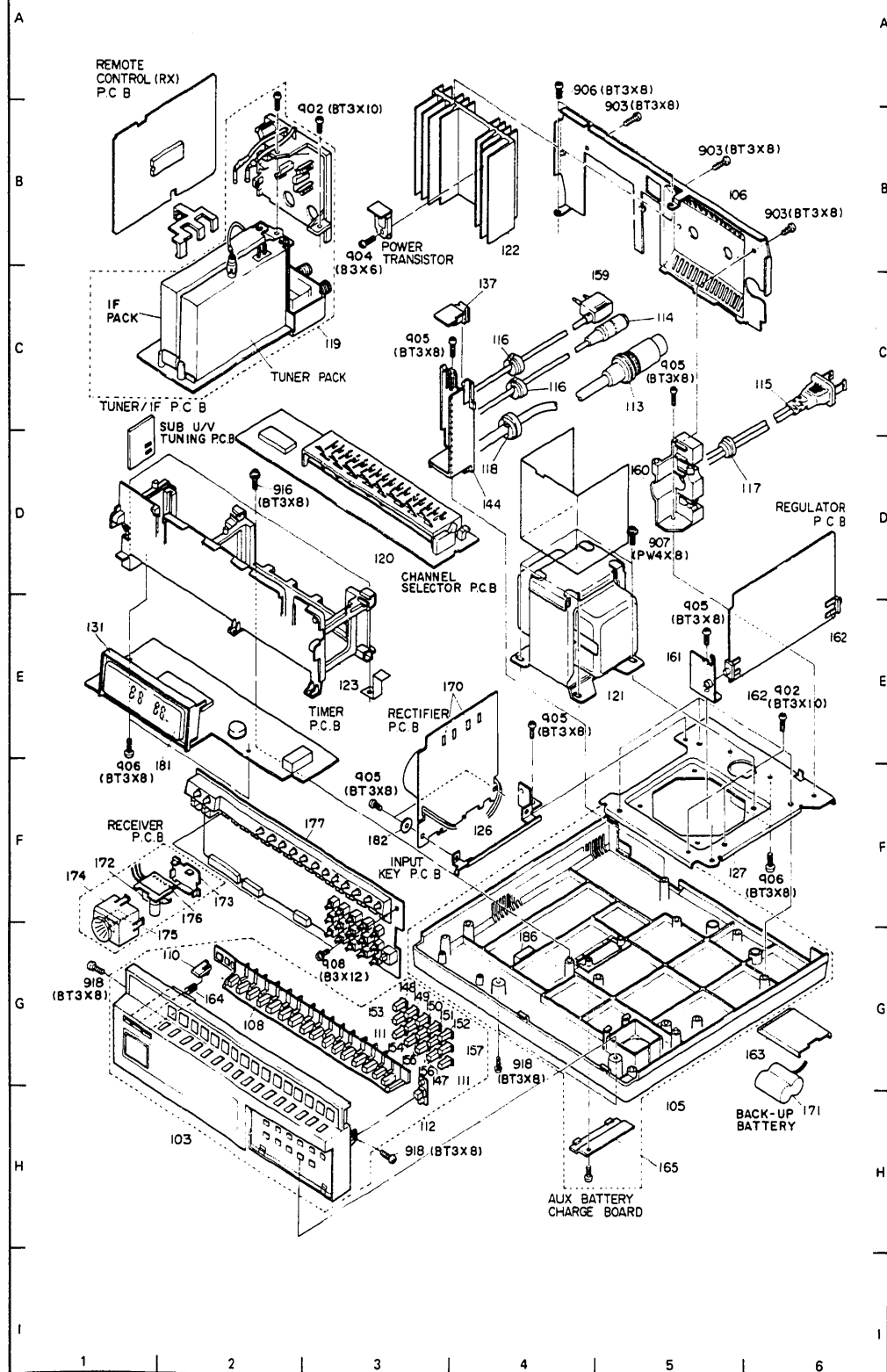


(VT-TU68A)



TOTAL ASSEMBLY

(VT-TU68A)



REPLACEMENT PARTS LIST

ELECTRICAL PARTS (VT-6800A)

SYMBOL-NO	P-NO	DESCRIPTION	SYMBOL-NO	P-NO	DESCRIPTION
CAPACITORS					
C516	Q256383	TANTALUM ELECTROLYTIC 4.7MF 16V	D501-503	5331592	DIODE 1SS133
C517-518	Q256403	TANTALUM 2.2MF 20V	D504	5331511	DIODE DAN201
C559	Q256383	TANTALUM ELECTROLYTIC 4.7MF 16V	D506-507	5331592	DIODE 1SS133
RESISTORS					
B801	5068292	RESISTOR BLOCK	D508	5331511	DIODE DAN201
RT201	5007432	SEMI VARIABLE 1.0KOHM	D510-511	5331511	DIODE DAN201
RT202	5007433	SEMI VARIABLE 2.2KOHM	D512	5331592	DIODE 1SS133
RT203-204	5007318	SEMI VARIABLE 20KOHM	D513-515	5331502	DIODE 1K34LF
RT205	5007432	SEMI VARIABLE 1.0KOHM	D516-524	5331592	DIODE 1SS133
RT401	5007464	SEMI VARIABLE 47KOHM	D526-527	5331592	DIODE 1SS133
RT402	5007465	SEMI VARIABLE 100KOHM	D528	5330714	DIODE H24R
RT403	5007464	SEMI VARIABLE 47KOHM	D529	5331592	DIODE 1SS133
RT404	5007466	SEMI VARIABLE 220KOHM	D530	5331511	DIODE DAN201
RT501	5007438	SEMI VARIABLE 100KOHM	D532	5331511	DIODE DAN201
RT502-503	5007553	SEMI VARIABLE 100KOHM	D534	5331511	DIODE DAN201
RT504-505	5007449	SEMI VARIABLE 47KOHM	D536-538	5331592	DIODE 1SS133
RT506	5007534	SEMI VARIABLE 220KOHM	D539	5331592	DIODE 1SS133
RT509-510	5007452	SEMI VARIABLE 220KOHM	D540	5331592	DIODE 1SS133
RT511	5007531	SEMI VARIABLE 470KOHM	D543-546	5331592	DIODE 1SS133
RT512	5007491	SEMI VARIABLE 470KOHM	D547	5331511	DIODE DAN201
RT513	5007439	SEMI VARIABLE 220KOHM	D548	5331592	DIODE 1SS133
RT514	5007453	SEMI VARIABLE 470KOHM	D549	5331592	DIODE 1SS133
RT516	5007532	SEMI VARIABLE 10KOHM	D550	5331511	DIODE DAN201
RT517	5007531	SEMI VARIABLE 470KOHM	D552	5331592	DIODE 1SS133
RT518-519	5007553	SEMI VARIABLE 100KOHM	D553	5331511	DIODE DAN201
RT520	5007453	SEMI VARIABLE 470KOHM	D556	5331511	DIODE DAN201
RT801	5007433	SEMI VARIABLE 2.2KOHM	D557	5331592	DIODE 1SS133
RV501	5008711	VARIABLE RESISTOR	D558	5331511	DIODE DAN201
R238-240	Q170348	FUSE RESISTOR 470OHM+-5%	D563-565	5331592	DIODE 1SS133
R316-317	Q170472	FUSE RESISTOR 3.30HM+-5% 1/4W	D566	5330327	DIODE HZ-9B2
R411	Q170481	FUSE RESISTOR 220HM+-5% 1/4W	D567	5331511	DIODE DAN201
R433	Q170474	FUSE RESISTOR 10 OHM+-5% 1/4W	D568-569	5331592	DIODE 1SS133
R685	Q149705	METAL FILM RESISTOR 470 OHM	D571	5331592	DIODE 1SS133
SEMI-CONDUCTORS					
D201-202	5331592	DIODE 1SS133	D590-593	5330552	ZENNER DIODE H211R
D207	5331592	DIODE 1SS133	D701-703	5331592	DIODE 1SS133
D208	5331053	DIODE 1K60RLF-SL	D704-706	5330104	RECTIFIER SILICON V06A 15K
D209	5331592	DIODE 1SS133	D707	5331431	DIODE ERB81
D211	5331053	DIODE 1K60RLF-SL	D710	5331592	DIODE 1SS133
D213-214	5331592	DIODE 1SS133	D802	5331592	DIODE 1SS133
D215	5331053	DIODE 1K60RLF-SL	D803	5331511	DIODE DAN201
D301-302	5331511	DIODE DAN201	D805-806	5331592	DIODE 1SS133
D303	5331592	DIODE 1SS133	D809-810	5331592	DIODE 1SS133
D304	5331511	DIODE DAN201	D814	5331592	DIODE 1SS133
D305	5331592	DIODE 1SS133	D815-816	5331592	DIODE 1SS133
D401-406	5330131	DIODE 1S2076	D820	5330713	DIODE HZ-3B
D407-408	5330131	DIODE 1S2076	D821	5330312	DIODE-ZENER SILICON
			D822	5330326	DIODE HZ-9C3
			D823	5331774	ZENNER DIODE R05.1JB1
			D830-837	5380491	LED LN-81P
			D838	5330553	DIODE H211C

SYMBOL-NO	P-NO	DESCRIPTION	SYMBOL-NO	P-NO	DESCRIPTION
D851	5331592	DIODE 1SS133	Q350	5321662	TRANSISTOR 2SC2021S
D901	5330573	DIODE 1S2473	1401-404	5321662	TRANSISTOR 2SC2021S
D902	5330104	RECTIFIER SILICON V06A 15K	Q501-502	5321661	TRANSISTOR 2SC2021R
D903-904	5331511	DIODE DAN201	Q503	5323101	TRANSISTOR 2SA937QR
D912-913	5380441	LED LN55	Q504	5322993	TRANSISTOR 2SA937QR
IC201	5358831	MODULE HT4214	Q505	5321661	TRANSISTOR 2SC2021R
IC202	5376001	IC HT4225	Q506	5322973	TRANSISTOR 2SC1652QR
IC203	5375741	IC HT4226	Q507	5322993	TRANSISTOR 2SA937QR
IC205	5375891	IC TA4351	Q508-509	5321661	TRANSISTOR 2SC2021R
IC207	5375761	IC TA4336	Q510	5321661	TRANSISTOR 2SC2021R
IC401	5352631	IC BA5102	Q511	5322993	TRANSISTOR 2SA937QR
IC402	5375771	IC TA4337	Q512-514	5321661	TRANSISTOR 2SC2021R
IC501	5375811	IC TA4341	Q515	5322993	TRANSISTOR 2SA937QR
IC502	5375822	IC TA4342A	Q516	5321661	TRANSISTOR 2SC2021R
IC503	5375832	IC TA4343A	Q517	5321661	TRANSISTOR 2SC2021R
IC504	5375841	IC TA4344	Q520	5321661	TRANSISTOR 2SC2021R
IC505	5375851	IC TA4345	Q701	5321294	TRANSISTOR 2SC 1740S
IC506	5352621	IC HA11727	Q702-705	5321661	TRANSISTOR 2SC2021R
IC507	5350251	IC HA1406	Q706-707	5320593	TRANSISTOR 2SA673C
IC508	5365821	IC MCL9372RS-1C	Q741	5321661	TRANSISTOR 2SC2021R
IC509	5352611	IC BA847	Q801-809	5322993	TRANSISTOR 2SA937QR
IC681	5352111	IC HA11714	Q812-814	5323014	TRANSISTOR 2SC2003FG
IC682	5352121	IC HA11715	Q815	5322993	TRANSISTOR 2SA937QR
IC701	5375781	IC TA4338	Q816	5323014	TRANSISTOR 2SC2003FG
IC702	5375651	IC TA4328	Q817	5322993	TRANSISTOR 2SA937QR
IC801	5365624	IC HD44820A48	Q901-902	5321662	TRANSISTOR 2SC2021S
IC802	5358872	IC TA4316A	Q903	5321663	TRANSISTOR 2SC2021R/S
IC803	5358782	IC TA4312A	Q912	5380471	PHOTO TRANSISTOR PN150TV
IC804	5365661	IC MPD4555	Q913	5380471	PHOTO TRANSISTOR PN150TV
IC805	5365481	IC MPD4049C	Q921-922	5321662	TRANSISTOR 2SC2021S
IC806	5365672	IC MB4204	Q923-924	5321662	TRANSISTOR 2SC2021S
IC807	5375801	IC TA4340	VR801	5340161	VARIATOR KH265
IC808	5358792	IC TA4313A	TRANSFORMERS		
IC810	5376211	IC TA4372	T401	5260223	BIAS OSC. TRANSFORMER
IC901	5358861	IC TA4310	COILS		
IC902	5375981	IC TA4352	L201	5152337	CHOKE COIL 100UH+-10%
IC903	5391041	IC DM101A	L205	5152331	CHOKE COIL 33UH+-10%
Q201	5322991	TRANSISTOR 2SA937Q	L206	5152342	CHOKE COIL 220UH
Q202-204	5321662	TRANSISTOR 2SC2021S	L208	5152331	CHOKE COIL 33UH+-10%
Q205	5331294	TRANSISTOR 2SC1740LMS	L208-209	5152337	CHOKE COIL 100UH+-10%
Q206-210	5321662	TRANSISTOR 2SC2021S	L211	5152328	CHOKE COIL 22UH+-10%
Q212-214	5321662	TRANSISTOR 2SC2021S	L212	5152337	CHOKE COIL 100UH+-10%
Q216	5322991	TRANSISTOR 2SA937Q	L213	5152336	CHOKE COIL 82UH+-10%
Q217	5321662	TRANSISTOR 2SC2021S	L214-215	5152337	CHOKE COIL 100UH+-10%
Q218	5322991	TRANSISTOR 2SA937Q	L217	5152099	CHOKE COIL 820UH+-10%
Q219-220	5321662	TRANSISTOR 2SC2021S	L218	5152733	CHOKE COIL 47UH+-10%
Q301-305	5321662	TRANSISTOR 2SC2021S	L219	5152337	CHOKE COIL 100UH+-10%
Q308	5321662	TRANSISTOR 2SC2021S			
Q309	5322991	TRANSISTOR 2SA937Q			

MECHANICAL PARTS (VT-6800A)

SYMBOL-NO	P-NO	DESCRIPTION
L221-222	5152337	CHOKE COIL 100UH+-10%
L225	5152337	CHOKE COIL 100UH+-10%
L401	5150361	CHOKE COIL
L402	5152346	CHOKE COIL 470UH+-10%
L403	5150575	CHOKE COIL 1000UH
L681	5152092	PFKING COIL 220MICROM
L701	5152099	CHOKE COIL 820MICRO H+-10%
MISCELLANEOUS		
CP201	5123831	TRAP FILTER
CP202	5123832	COIL
CP203	5162032	DELAY LINE
CP204	5162031	LOW PASS FILTER
CP205	5162033	LOW PASS FILTER
CP206	5162163	LOW PASS FILTER
CP207	5162033	LOW PASS FILTER
CP208	5162042	BAND PASS FILTER
CP209	5162162	LOW PASS FILTER
CP301	5162161	DELAY LINE
DL201	5785211	DELAY LINE
DL202	5785052	DELAY LINE
FH701-702	5770181	FUSE HOLDER
F701	5721222	FUSE 3A
F702	5721225	FUSE 4A
J703	5678092	JACK
MT801	5553171	METER
RL401-403	5641481	RELAY
RL701	5641402	RELAY
S801	5633317	SWITCH
S803	5633621	PUSH SWITCH
S804	5624272	SWITCH
S805-812	5633671	PUSH SWITCH
S914	5625061	SWITCH - MECHA STATE
S915	5633362	PUSH SWITCH - CASSETTE HOLDER
S916	5633362	PUSH SWITCH - SAFETY TAB

SYMBOL-NO	P-NO	DESCRIPTION
FOR FINAL ASSEMBLY		
101	6093470	CASSETTE LID (U)
101	6093417	CASSETTE LID (C)
102	7547745	SCREW
103	6865105	TOP CASE ASSEMBLY
104	6225338	FRONT PANEL ASSEMBLY
105	6334312	HANDLE
106	6865114	BOTTOM CASE ASSEMBLY
107	6174272	BATTERY COVER
108	6861593	JACK COVER
109	7373294	SIDE BRACKET (LEFT)
110	7373304	SIDE BRACKET (RIGHT)
111	7782055	SPECIAL SCREW
112	6862503	BUTTON
114	6864972	REAR CAP
116	5585672	RF CONVERTER
117	6861581	KNOB
118	6862791	HOLDER-RF CONVERTER
119	7459054	SHIELD PLATE
121	6860942	P.C.B HOLDERS
122	6660951	P.C.B HOLDER
124	6302951	SPRING
125	6861132	EJECT ARM
126	6861951	EJECT BUTTON ASSEMBLY
127	5559491	COUNTER
128	6053731	BUTTON-COUNTER
129	6355311	BELT
130	6054083	BUTTON
131	6862486	HOLDER - TRACKING
132	6861573	KNOB
133	6815111	2MM LOCK WASHER
134	6053761	BUTTON-MEMORY
135	6861561	KNOB-SPEED
137	5679921	JACK PLATE
138	5677531	JACK PLATE (CAM)
139	6862032	HINGE
140	6861971	HINGE
141	6795251	NYLON RIVET-3MM
143	6329894	SPRING (PLATE)
144	6534569	SPRING A
145	6534593	SPRING B
146	6862783	GUIDE PIECE
147	6714216	NYLON RIVET
153	7712629	SPACER
154	7756871	SPACER
158	6862463	HOLDER-LED
159	6714231	NYLON RIVET-3MM
180	5270531	SWITCHING REGULATOR

SYMBOL-NO	P-NO	DESCRIPTION	SYMBOL-NO	P-NO	DESCRIPTION
182	6755481	IC HOLDER	244	7372421	BRAKE ARM (LEFT)
185	6862071	FUSE HOLDER	245	6301634	SPRING
187	6560134	BRAKE PAD	246	7372431	BRAKE ARM (RIGHT)
189	6864241	CAP	248	6345173	FF/REW PULLEY
190	6570391	CAP	249	7773089	SCREW 3MMX4MM
201	6861424	LOADING GEAR	250	7786178	POLYESTER WASHER
202	6861393	LOADING WORM	251	6861471	FF/REW IDLER
203	6861425	LOADING GEAR	252	0948492	BALL - 2MM
204	6861063	SUB BRAKE	253	6861301	FF/REW ARM
205	7372541	ARM	254	6541881	SPRING
206	6861181	SUB BRAKE ARM	256	5576864	MOTOR-REEL
207	7372511	SWITCH BRACKET	257	6861505	FS BRAKE ASSEMBLY
208	6861091	SPRING	258	6542031	SPRING
209	6301396	SPRING	259	6355291	BELT
210	7372092	ARM	261	7372032	SLIDER
211	6861121	SPACER	262	6862331	HOLDER
212	7372002	SLIDER	263	7778855	POLY SLIDER WASHER
213	6355301	BELT	264	6864144	MAGNET PULLEY
214	7778859	POLYSLIDER WASHER	265	7778859	POLYSLIDER WASHER
215	6414312	TAKE-UP REEL TABLE ASSEMBLY	266	5576835	S2 CAPSTAN MOTOR
216	7786216	POLYSLIDER WASHER	267	7372282	PLATE
217	7787031	THRUST SUPPORT	268	5791971	BRUSH
218	6750441	RETAINER	269	6973801	S2 CATCHER 1R
219	7787031	THRUST SUPPORT	270	6973811	S2 CATCHER DR
220	6421904	PULLEY	271	6344252	GUIDE ROLLER SHAFT
221	7778859	POLYSLIDER WASHER	272	6977181	TILT POLE (TAKE-UP)
222	6345151	PULLEY	272	6977181	TILT POLE (TAKE-UP)
223	7786178	POLYESTER WASHER	273	6977152	GUIDE ROLLER BASE
224	7778855	POLY SLIDER WASHER	273	6977152	GUIDE ROLLER BASE
225	0945039	BEARING-2MM	274	7544352	LOCK SHAFT
226	6861212	FF/REW ARM	276	6861442	IMPEDANCE ARM
227	6318926	SPRING	277	5448543	FULL ERASE HEAD
228	6861142	EJECT INHIBITING ARM	278	6861222	HEAD ARM
229	7372442	BRAKE LINK	279	6861103	TENSION ARM OPERATION
230	6861174	BRAKE ARM	280	6977171	TILT POLE (SUPPLY)
231	6300602	SPRING	280	6977171	TILT POLE (SUPPLY)
232	7778859	POLYSLIDER WASHER	282	7550352	GUIDE FRAGI
233	6861481	PLAY IDLER ASSEMBLY	283	7575242	TAPE GUIDE
234	7372144	SLIDER B	284	7598461	GUIDE FLANGE
235	6541902	SPRING	285	6304903	SPRING
236	7372131	SLIDER A	286	6535621	SPRING
237	7372151	SPRING HOOK	287	6977211	CYLINDER BASE
238	7778395	E RING	288	5448562	HEAD
239	7372522	TENSION BAND	289	6355471	BELT
240	7372412	TENSION ARM	290	6861433	PULLEY
241	6541752	SPRING	291	7374771	MOTOR-LOADING
242	6414302	SUPPLY REEL TABLE ASSEMBLY	293	7371932	X-OPERATING ARM
243	6860992	RECORDING PREVENTION ARM			

SYMBOL-NO	P-NO	DESCRIPTION	SYMBOL-NO	P-NO	DESCRIPTION
294	6301371	SPRING	424	6860932	ARM
295	7373511	BRAKE LEVER	425	7373342	DUMPER HOLDER
296	6319001	LOCK SPRING B	426	7779872	WASHER
297	7778395	E RING	427	7371842	SYNCHRO PLATE
298	7372484	BRAKE SLIDER	428	7371722	LOCK ARM (LEFT)
299	7571111	COLLAR	429	6324439	SPRING
300	7786216	POLYSLIDER WASHER	501	5358321	UPPER CYLINDER
301	7372382	BRAKE SLIDER	502	5358341	LOWER CYLINDER
305	0170316	DEW SENSOR	901	8661408	SCREW (PW3X8)
306	6383213	PRESSURE ROLLER ASSEMBLY	902	8661408	SCREW (PW3X8)
307	6977142	PRESSURE ROLLER	903	8724406	FLAT SCREW-3MMDX6MM
308	6546551	SPRING	904	7781582	FLAT SCREW-3MMDX10MM (BLACK)
309	7549271	X-ADJUST SCREW	905	8724406	FLAT SCREW-3MMDX6MM
310	7373393	MG. PLATE	906	7781582	FLAT SCREW-3MMDX10MM (BLACK)
311	6329861	SPRING	908	7781137	SCREW (BT3X16B)
312	7317942	LIMIT PLATE	910	7782151	SCREW
313	7372471	IMPEDANCE OPERATING ARM	911	7782151	SCREW
316	7372502	HEAD BASE	912	7782151	SCREW
317	5448533	AUDIO CONTROL HEAD	914	7777672	PAN HEAD SCREW
318	7586681	SCREW	978	0721305	FLAT SCREW 2.6MMD X 5MM
319	6304901	SPRING	979	8741404	BIND SCREW-3MMDX4MM
322	7551012	GEAR SHAFT			
325	6546852	SPRING			
326	6300742	SPRING			
330	6751261	LED HOLDER (1)			
331	6861311	LED HOLDER			
401	7372333	CASSETTE HOLDER			
402	6861011	LOCK ARM (LEFT)			
403	6540663	SPRING			
404	7778394	E RING 1.5MMD			
405	6344381	ROLLER			
406	6861001	LOCK ARM (RIGHT)			
407	6540663	SPRING			
408	7372323	CASSETTE UP ASSEMBLY			
409	7230902	E RING			
410	7372851	SHAFT			
411	7371761	HOLDER BRACKET (LEFT)			
412	6541491	SPRING			
413	7230902	E RING			
414	7372233	HOLDER BRACKET (RIGHT)			
415	6344381	ROLLER			
416	7778394	E RING 1.5MMD			
417	7778843	WASHER			
418	7371741	LOCK ARM (RIGHT)			
419	6546443	SPRING			
420	6324439	SPRING			
421	7371732	SHAFT HOLDER			
422	6431032	GEAR			
423	7372204	DUMPER ASSEMBLY			

FOR ACCESSORIES

5679542	CONNECTOR
5679592	MATCHING BOX
5731011	EARPHONE
5896761	CABLE
6865081	DRIVER

ELECTRICAL PARTS (VT-TU68A)

SYMBOL-NO	P-NO	DESCRIPTION	SYMBOL-NO	P-NO	DESCRIPTION
CAPACITORS					
C103	0239325	CYLINDRICAL CERAMIC 10000PF	D701-732	5330131	DIODE 1S2076
C105	0209026	CERAMIC DISC (RESISTOR SHAPE) 0.01M F+-30	D733	5330101	RECTIFIER SILICON V06C 15K
C110	0209026	CERAMIC DISC (RESISTOR SHAPE) 0.01M F+-30	D734	5330131	DIODE 1S2076
C151	0209026	CERAMIC DISC (RESISTOR SHAPE) 0.01M F+-30	D902-904	5331592	DIODE 1S5133
C153	0209022	CERAMIC DISC (RESISTOR SHAPE) 0.002 2MF+-	D906-915	5331592	DIODE 1S5133
C403	0209026	CERAMIC (RESISTOR SHAPE) 470PF+-10%	D917	5331592	DIODE 1S5133
C701	0209026	CERAMIC DISC (RESISTOR SHAPE) 0.01M F+-30	D920	5331592	DIODE 1S5133
C703	0209022	CERAMIC DISC (RESISTOR SHAPE) 0.002 2MF+-	D926	5330101	RECTIFIER SILICON V06C 15K
C903-904	0209027	CERAMIC (RESISTOR SHAPE) 0.01M F+-30%	D927	5331592	DIODE 1S5133
C905	0239326	CYLINDRICAL CERAMIC	D951	5331401	DIODE SS-5
C906-910	0209027	CERAMIC (RESISTOR SHAPE) 0.015 F+-30%	D953	5331402	DIODE SS-5R
RESISTORS					
R902	0171011	METAL FILM 0.22 OHM+-10% 2W	D955-956	5330341	RECTIFIER SILICON W0-6A 50M
R914	5007182	SEMI VARIABLE RESISTOR 470OHM	D999	5330001	RECTIFIER SILICON V03C 60M
R917	0170092	OXIDE METAL FILM RESISTOR 1.5KOHM	IC101	5352782	IC MPC78M10
R951	0134704	COMPOSITION RESISTOR 2.2M OHM +-10% 1/2G	IC102	5365857	IC HD38800A56
R956	0111153	METAL OXIDE 1KOHM 1W	IC103	5260871	OSC. BLOCK
SEMI-CONDUCTORS					
D101	5331592	DIODE 1S5133	IC104	5365813	IC TIME MODULE
D105	5331592	DIODE 1S5133	IC1401	5350601	IC NJM 4558D
D109	5331592	DIODE 1S5133	IC151	5351722	IC MPC1363C
D111-112	5331592	DIODE 1S5133	IC401	5369131	IC MP0554C-90
D113-114	5330131	DIODE 1S2076	IC402	5365871	IC TC4514BP
D151	5331592	DIODE 1S5133	IC403-405	5359901	IC UP04066C
D152-155	5331592	DIODE 1S5133	IC406	5375871	IC TA4347
D156	5331592	DIODE 1S5133	IC407	5375861	IC TA4346
D157-160	5331592	DIODE 1S5133	IC701	5351722	IC MPC1363C
D161	5330131	DIODE 1S2076	IC702	5375881	IC TA4348
D162-163	5331592	DIODE 1S5133	IC901	5350603	IC NJM4558
D164-166	5330131	DIODE 1S2076	LD151-169	5380701	LED GL-5PR5
D167	5331592	DIODE 1S5133	P0151	5380891	DIODE PH302
D168-169	5330131	DIODE 1S2076	Q1-2	5321663	TRANSISTOR 2SC2021R/S
D170-172	5331592	DIODE 1S5133	Q103-105	5321663	TRANSISTOR 2SC2021R/S
D173-175	5330131	DIODE 1S2076	Q106	5322213	TRANSISTOR 2SC1741R
D176	5331592	DIODE 1S5133	Q151	5321663	TRANSISTOR 2SC2021R/S
D177-179	5330131	DIODE 1S2076	Q402-404	5321663	TRANSISTOR 2SC2021R/S
D180-183	5331592	DIODE 1S5133	Q701	5321663	TRANSISTOR 2SC2021R/S
D401	5331592	DIODE 1S5133	Q901	5322921	TRANSISTOR DT-812
D402	5330573	DIODE 1S2473	Q902-903	5321662	TRANSISTOR 2SC2021S
D1402	5331592	DIODE 1S5133	Q906	5321662	TRANSISTOR 2SC2021S
			Q909-912	5321662	TRANSISTOR 2SC2021S
			Q915	5322472	TRANSISTOR 2SB644S
			Q916	5321662	TRANSISTOR 2SC2021S
			Q917	5322214	TRANSISTOR 2SC1471AP
			Q918	5322993	TRANSISTOR 2SA937QR
			Q951	5320593	TRANSISTOR 2SA673C
			Q952-953	5321662	TRANSISTOR 2SC2021S

SYMBOL-NO	P-NO	DESCRIPTION
Q901	5322921	TRANSISTOR DT-B12
Q902-Q903	5321662	TRANSISTOR 2SC2021S
Q906	5321662	TRANSISTOR 2SC2021S
Q909-912	5321662	TRANSISTOR 2SC2021S
Q915	5322472	TRANSISTOR 2SB644S
Q916	5321662	TRANSISTOR 2SC2021S
Q917	5322214	TRANSISTOR 2SC1471AP
Q918	5322993	TRANSISTOR 2SA937QR
Q951	5320593	TRANSISTOR 2SA673C
Q952-953	5321662	TRANSISTOR 2SC2021S
Q1401	5320593	TRANSISTOR 2SA673C
Q1402	5321501	TRANSISTOR 2SK6B-6
Q1403-1405	5321663	TRANSISTOR 2SC2021RS
ZD101	5330841	ZENNER DIODE RD5.1E-B
ZD102	5331582	DIODE RD5.6E-B3
ZD103	5330552	ZENNER DIODE HZ11B
ZD104	5330313	ZENNER DIODE HZ-7C
ZD105	5330552	ZENNER DIODE HZ11B
ZD106	5331774	ZENNER DIODE RD5.1JB1
ZD107	5330556	ZENNER DIODE HZ11A2
ZD401-403	5330532	DIODE SILICON HZ-12B 1.0M
ZD404	5330553	DIODE HZ11C
ZD405	5330317	DIODE HZ7C-1
ZD701	5330317	ZENNER DIODE HZ7A-1
ZD901	5331587	DIODE RD5.6E-B1
ZD951	5350611	IC UPC574J
ZD952	5330847	DIODE RD2.7E-B2

SYMBOL-NO	P-NO	DESCRIPTION
COILS		
L1401	5150374	CHOKE COIL 12MH
L1402	5150366	CHOKE COIL 15+-10
L151	5152087	PEAKING COIL 100MICROH
L401-L406	5152087	PEAKING COIL 100MICROH
L701	5152087	PEAKING COIL 100MICROH
CRYSTALS		
X401	5780501	CERAMIC OSCILLATOR DEVICE
MISCELLANEOUS		
F950	5721221	FUSE
F951	5721225	FUSE 4A
F952	5721165	FUSE 500MA
J1	5678102	DC JACK
S151-166	5633673	SWITCH (CH)
S167-181	5633781	SWITCH
S182-185	5633791	SWITCH
S701	5633572	PUSH SWITCH
S702	5633671	PUSH SWITCH

MECHANICAL PARTS (VT-TU68A)

SYMBOL-NO	P-NO	DESCRIPTION
FOR FINAL ASSEMBLY		
101	6108583	TOP CASE (U)
101	6108584	TOP CASE (C)
102	6864733	CHANNEL LID
103	6225262	FRONT PANEL
104	6099762	TIMER LID
105	6108592	BOTTOM CASE
106	7374912	REAR PANEL
108	6862494	BUTTON (CHANNEL) ASSEMBLY
110	6055991	BUTTON (TV/VTR, TIMER CHARGE)
111	6055341	BUTTON
112	6055902	BUTTON (DIM)
113	5899851	10P DIN CORD
114	5898175	CABLE WITH PLUG
115	5746493	AC CORD
116	6794011	BUSHING
117	6794276	BUSHING
118	6794091	BUSHING
119	7084511	TUNER IF BLOCK
120	5008782	PRE-SET VARIABLE RESISTOR
121	5213131	POWER TRANSFORMER
126	7373232	BRACKET-RECT
131	6864751	HOLDER-TIMER DISPLAY
133	6865031	HOLDER (CH. CARD)
134	6864812	CHANNEL CARD
144	6864841	WIRE HOLDER
147	6055342	BUTTON
148	6055361	BUTTON
149	6055362	BUTTON
150	6055363	BUTTON
151	6055364	BUTTON
152	6055365	BUTTON
153	6055366	BUTTON
154	6055367	BUTTON
155	6055368	BUTTON
156	6055369	BUTTON
157	6055370	BUTTON
159	5747531	SP CORD
163	6864721	BATTERY COVER
165	6864712	FUSE COVER
170	5722211	FUSE HOLDER
171	5761161	BATTERY
172	6590381	SPACER
173	6864951	I.R RECEIVER COVER
174	6864961	I.R RECEIVER CAP
175	7758651	I.R RECEIVER FILTER
176	7758592	INSULATION SHEET
177	6865041	LED HOLDER

SYMBOL-NO	P-NO	DESCRIPTION
181	5310632	TIMER DISPLAY
901	8661408	SCREW (PW3XB)
903	8699408	BT BIND HEAD SCREW-3MMDX8MM (BLACK)
905	8699408	BT BIND HEAD SCREW-3MMDX8MM (BLACK)
907	8660606	4X6 PW SCREW
912	8671406	DT SCREW-3MMDX6MM
918	8691408	BIND TAPPING SCREW-3MMDX8MM (BLACK)
FOR ACCESSORIES		
	5639602	REMOTE CONTROL BOX
	5893171	FEEDER CABLE

IC PIN SPECIFICATIONS

ICs described:	HD44820A48	IC901	(SYSTEM CONTROL)
	HA11727	IC506	(SERVO)
	BA847	IC509	(SERVO)
	HD44700A08	IC01	(REMOTE CONTROL)
	μPD554C-90	IC401	(REMOTE CONTROL)
	HD38800A62	IC102	(TIMER)

How to read the table

Pin	I/O	Active level	Abbreviation	Function

Pin No.

Input/output pin
I: Input
O: Output
I/O: In common
for input/output

Level in execution of
specified operation
Hi, Lo

Abbreviation of
operation executed
during input/output

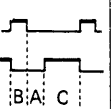
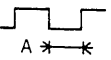
Data concerning the
input and output,
and the operation
following it.

SYSTEM CONTROL IC (IC901) PIN SPECIFICATIONS

HD44820A48

Function: VTR system control

Pin	I/O	Active Level	Abbreviation	Function	
1			LOAD	Loading motor control outputs	Forward rotation (loading)
2			UNLOAD		Reverse rotation (unloading)
3	O	Lo	SLACK REW	Reel motor control outputs	Slack removing reverse rotation.
4			SEARCH REW		Reverse rotation for reverse search. (Both pins 3, 4: Reverse rotation for rewind at Lo.)
5			F. FWD		Forward rotation for forward search.
6	O	Lo	NO-STANDARD PB (SPEED PLAY)	Output during play at other speeds than the standard speeds (SP, LP, EP).	
7	O	Hi	OSC STOP	Bias oscillation stop control output. When recording, audio dubbing: Lo.	
8	O	Lo	MUTE	Audio muting control output during Loading/Unloading, Variable speed play.	
9	O	Lo	CYL ON	Cylinder start output.	
10	O	Lo	REVERSE	Capstan motor reverse rotation output. During reverse search, phase-matching: Lo.	
11	O	Lo	LOADING	Monitor-cut output during loading, dubbing pause.	
12	O	Lo	PAUSE	Operation mode control outputs.	Pause output.
13			MODE 1		Play/Dubbing output.
14			MODE 2		Record/Dubbing output.
15			MODE 3		Frame-advance/Search output.
16			MODE 4		Slow/Search output.
17	I/O	Lo	V. DUB	Video dubbing (insert) mode control input/output. Operation input/display output.	
18	I	Hi	CAMERA	Camera connection input. For record check and camera pause. (pause of VTR is ineffective.)	
19	I	Lo	C. PAUSE	Pause control input by camera.	
20	I	Lo	MEMORY	Tape count finish detection input. "9999" is effective during rewind and insert modes.	
21	I	Hi	RESET	Reset input of μ P.	
22	I	Lo	GND	GND of μ P.	
27	I	5V	Vcc	Power input of μ P.	
28	I	Lo	TIME ON	Timer-recording execution input.	
29	I	Hi	STAND-BY	Camera stand-by input. Power save (when battery is used) instruction.	
30	I	Lo	BATTERY	Battery power detection. Power save: With Lo, 5 minutes after record pause. Power off: With Lo, 5 minutes after stop.	

Pin	I/O	Active Level	Abbreviation	Function	
31	I	Lo	POWER ON	When the power switch is set to ON, this pin is set to Lo and the μP performs the power relay hold operation.	
32	I	Lo	STATE 1	Mechanism state input	Stop/F. FWD
33			STATE 2		F. FWD/Pause/Play
34			STATE 3		Play/Slow
Note: REW is the same as F. FWD. Record, Dubbing are the same as Play, and Frame-advance, Still the same as Slow.					
35	I	Lo	DEW	Condensation detection input. Set the VTR to Stop mode and inhibits Operation input. Flashes Stop display.	
36	I	Hi	REW END	Rewind end detection input. During Rewind: Stop During Reverse search: Play	
37	I	Hi	FWD END	Forward end detection input. Set the VTR to Stop mode.	
38	I	Hi	REMOTE	Remote control operation input. Sets to Remote control operation mode and performs A/D conversion together with the outputs of pins 42 – 45.	
39	I/O	Lo (DIGIT)	PAUSE	Operation inputs & operation display outputs	Pause mode
40			A. DUB		Dubbing mode
41			REC		Record mode
42			PLAY		Play mode
43			F. FWD		F. FWD mode
44			STOP		Stop mode
45			REW		Rewind mode
46	O		PHASE 1	Operation input/output timing pulses (400Hz). A: Remote control operation input period. B: Operation button input period. C: Indicator lighting period.	
47	O		PHASE 2		
48	O	Lo	SAVE	Save instruction output. Reduces power consumption to 1/5 when the battery power is used, during the camera stand-by mode, or 5 minutes after the record pause mode is entered.	
49	O	Hi	V. DUB	Video dub (insert) instruction output.	
50	I	Lo	CASSETTE	Cassette holder condition input (Lo: Down). When it is set to Hi, operation button input is not accepted.	
51	I	—	SAFETY TAB	Safety Tab presence/absence detection input. Lo: Record, Dubbing inhibited (The VTR enters the play mode during timer recording). Hi: Recording possible (Tab present).	
52	I	Hi	CYL LOCK	Reduced cylinder speed detection input. Hi: The VTR enters the Stop mode.	
53	I		REEL LOCK	Tape running abnormal stop detection input. The VTR enters the stop mode with A > 3 sec. in the standard play mode, and enters the Stop mode with A > 1.5 sec. in the F. FWD, Rewind and Search modes.	

			Mechanism			Motor operation					Signal control					Mode control						
Abbreviation and pin			STATE			LOAD	UNL	REW SLACK	REW SEARCH	F. FWD	N. SPB	OSC STOP	MUTE	CYL ON	REV	LOADING	PAUSE	MODE				V. DUB
			1	2	3														1	2	3	4
VTR operation			32	33	34	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	49
Operation mode	Stop	Stop	Lo																			
		Pause	Lo																			
	F. FWD		Lo	Lo					Lo													
	Rewind		Lo	Lo				Lo	Lo													
	Play	Play		Lo	Lo									Lo				Lo				
		Forward search		Lo	Lo						Lo		Lo	Lo				Lo		Lo	Lo	
		Reverse search		Lo	Lo				Lo		Lo		Lo	Lo	Lo			Lo		Lo	Lo	
		Slow			Lo						Lo			Lo				Lo			Lo	
		Frame-advance			Lo						Lo			Lo				Lo		Lo		
		Still (Pause)			Lo						Lo			Lo			Lo	Lo				
	Record	Record		Lo	Lo							(Lo)		Lo					Lo			
		Pause		Lo								(Lo)		Lo			Lo		Lo			
		Insert		Lo	Lo							(Lo)		Lo					Lo			L
	Dubbing	Dubbing		Lo	Lo							(Lo)		Lo				Lo	Lo			
		Pause		Lo								(Lo)		Lo			Lo	Lo	Lo			
Sound-on-Sound			Lo	Lo							(Lo)		Lo					Lo	Lo			
Transient mode	Loading		Note-1			Lo							Lo	Lo		Lo						
	Unloading						Lo	Lo					Lo									

Hi, Lo are active levels.
However, Lo inside () shows the non-active level.

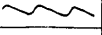
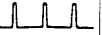
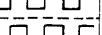
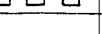
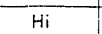
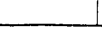
Note-1: Each pin outputs according to the above table when the VTR passes through each mechanism state position,
STOP → F. FWD → PAUSE → PLAY → SLOW.
All the pins are set at Hi in the mechanism transient period.

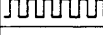
CYLINDER/CAPSTAN SERVO IC (IC506) PIN SPECIFICATIONS

HA11727

Function: Digital servo circuit

- Cylinder phase control circuit
- Capstan speed control circuit
- Capstan phase control circuit

Pin	I/O	Active Level	Abbreviation	Function
1	I	—	MM	Tach pulse monostable multivibrator (MM) time constant set pin. This MM delays the tach pulse and determines the fall of SW30Hz pulse in CH-1.
2	I		CYL TACH	Cylinder tach pulse input pin.
3	I	Hi	SW30	Sets the duty of the PWM wave generated in the both phase control systems to 50% when receiving Hi.
	O			SW30Hz pulse output pin.
4	O		CYL PHASE	Cylinder phase control output pin. 874Hz PWM wave.
5	I	Hi	REC CTL INHIBIT	Inhibits the recording of the CTL pulse with Hi input.
6	O		CYL SPEED	Output pin of cylinder speed control output.
7	I		CYL SPEED	Input pin of cylinder speed control output. This is grounded when Hi is applied to pin 9.
8	I		SAWTOOTH	Short-circuits cylinder speed control sawtooth wave. This is grounded when Hi is applied to pin 9.
9	I	Hi	CYL CONTROL	Cylinder speed control system control input pin. When Hi is applied, the input pin (pin 7) of the control output of the cylinder speed control system and the sawtooth wave line (pin 8) are grounded.
10	I		3.58MHz	Servo circuit reference signal, clock pulse generation source signal input pin. Divides 3.58MHz to produce the reference signal REF30, clock pulse 447kHz.
11	I		V. SYNC	Vertical sync signal (60Hz) input pin. 30Hz is obtained by dividing 60Hz.
12	I	Lo	GND	GND
13	I		R/P CTL	CTL pulse input pin during play.
	O			CTL pulse output pin during recording.
14	I		CTL NFB	Negative feedback circuit pins of the CTL amp.
15	O			
16	I	Hi	Vcc	Power input pin. 9V.
17	I		CFG	Capstan FG (CFG) input pin. SP: 240Hz, LP: 360Hz, EP: 720Hz
18	I		CFG NFB	Negative feedback circuit pins of the CFG amp.
19	O			

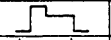
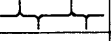
Pin	I/O	Active Level	Abbreviation	Function
20	I	Hi	SEARCH	Search mode input pin. Varies the frequency of the reference signal when Hi is applied. (becomes higher) VTR enters the forward search mode when pin 21 is set to Lo and pin 20 to Hi.
	O	Lo		Phase-matching brake pulse output pin during phase-matching operation. Negative pulse equivalent to phase difference between the vertical sync signal and CTL pulse.
21	I	—	TRACKING	Time constant set pin of the tracking monostable multivibrator and reverse search mode input pin.
		Hi		VTR enters the reverse search mode when Hi is applied to this pin and pin 20 simultaneously.
22	O		CAPSTAN SPEED	Capstan speed control output pin. 3.5kHz PWM wave.
23	O		CAPSTAN PHASE	Capstan phase control output pin. PWM wave with the frequency 1748Hz in SP, 874Hz in LP and 473Hz in SLP.
24	I	—	PB/REC	Record, play, assemble mode input pin. Open: Record mode.
		Hi		Hi: Play mode.
		Lo		Lo: Assemble mode (phase-matching, insert). Controls comparing the play CTL pulse and vertical sync signal.
25	I	—	SP/LP/EP	Tape speed input pin. Changes over the servo circuit as shown below depending on the input level. 1V – 4V: SP, Lo: LP, 4V or more: EP.
26	I	—	FAST/SLOW	Play tape speed input pin. Performs Fast (double speed), Slow (1/2 speed) playback depending on the input level. Vcc: Fast, 1/2Vcc: Slow.
27	I	Hi	5V	Power input pin of PWM generator.
28	I	—	NTSC/PAL	NTSC/PAL select input pin. Lo: NTSC, Hi: PAL

CAPSTAN DRIVE TIMING CONTROL IC (IC509) PIN SPECIFICATIONS

BA847

Functions: Slow, Still, Frame-advance circuits and Phase-matching circuit

Pin	I/O	Active Level	Abbreviation	Function
1	I	Hi	SLOW/F. ADV	Slow, Frame-advance mode input pin. Changes over inside to the slow format.
2	I	Vcc/2 Vcc	PAUSE/STILL	Phase-matching control pin, Still mode input pin,
3	I	—	MM6	Time constant set pin of MM6. MM6 generates the pulse for slow operation until a stabilized still picture is obtained at the beginning of still play.
4	I	—	MM7	Time constant set pin of MM7. MM7 generates the stop time control pulse to control the slow speed.
5	I	—	MM8	Time constant set pin of MM8. MM8 shapes the CTL pulse fed from pin 19 to remove the noise component in the pulse.
6	I	—	MM9	Time constant set pin of MM9. MM9 generates the pulse which enables to start recording after a certain period when phase-matching with a tape on which CTL pulses are not recorded. MM9 is triggered when pause is released.
7	O	Hi	REC START	Phase-matching control output pin. Controls record inhibition of the video signal system during the phase-matching period.
8	I	Hi-Lo	U/D COUNT	Phase-matching counter control pin. Hi: UP counter. Lo: DOWN counter
9	O		REC CTL	CTL pulse output pin during recording.
10	I	—	MM5	Time constant set pin of MM5. MM5 determines the output period of the capstan drive pulse during slow playback. MM5 determines the duty of the CTL pulse during recording.
11	I	Lo	GND	GND
12	I	—	MM4	Time constant set pin of MM4. MM4 delays the CTL pulse during recording.
13	O I	 	R/P CTL	Output pin of CTL pulse applied to IC from pin 19 during playback. Input pin of CTL pulse during recording.
14	O	Lo	BRAKE	Brake pulse output pin.
15	I	—	MM3	Time constant set pin of MM3. MM3 forms brake pulse from the CTL pulse.
16	I	—	MM2	Time constant set pin of MM2. MM2 delays the play CTL pulse. Slow tracking control pin.

Pin	I/O	Active Level	Abbreviation	Function
17	O	Lo	SLOW/STILL	Slow, Still, Frame-advance cancel output pin. Set to Lo in any of the above modes.
18	O		RUN/STOP	Capstan motor drive pulse output pin.
19	I		PB CTL	Play CTL pulse input pin.
20	I	—	MM1	Time constant set pin of MM1. MM1 generates the capstan motor start trigger pulse from SW30Hz.
21	I		SW30	SW30Hz pulse input pin.
22	I	Hi	Vcc	Power input pin (9V).

REMOTE CONTROL TRANSMITTER IC (IC01) PIN SPECIFICATIONS

HD44700A08

Function: Remote control transmission signal encoder

Pin	I/O	Active Level	Abbreviation	Function
3	O	Hi	OPERATION	Transmission period pulse. Outputs the pulse (width: 56msec, period: 80msec) only when a key is set to ON.
4	O	Hi	SERIAL OUT	Serial signal output pin. Outputs the serial signal corresponding to the key when the μ P inputs button operation. The codes from 1st bit to 7th bit of the serial signal corresponding to the key input which is received by this pin is shown in Table A.
5	I	Lo	REC MODE	Inputs the record button operation. Judges the record mode together with the play button operation.
6	I	Lo	DUB MODE	Inputs the audio dub button operation. Judges the audio dub mode together with the play button operation.
7	I	—	MODE SW	PWM selector inputs. The modulation system of the serial pulse is changed to PWM (Pulse Width Modulation) by this pin.
8	I	—		Pin 7 is set to Lo, and pin 8, to Hi because the PWM system is used in this unit.
9	I	Lo	RESET	Clears RAM of μ P. Reset is performed when the batteries are inserted.
10	I	Lo	GND	GND of μ P.
11	—		OSC 1	Clock frequency set pins of μ P. (200kHz)
12	—		OSC 2	
13	I	Hi	HLT	μ P operation input. Operates μ P only when an operation button is pressed. When button operation is done, the μ P inputs the key at Hi. When the button operation is not done, the μ P enters the stand-by mode at Lo.

Pin	I/O	Active Level	Abbreviation	Function
14	I	Hi	Vcc	Power supply of μ P.
15	O	Hi	1G	Key discrimination signal outputs. Hi outputs regardless of the μ P operation. μ P detects the operation mode by the pin to which this output is fed.
16			2G	
17			3G	
18			4G	
19	I	Hi	MATRIX 1	Key inputs. The operation mode is determined by the key input to which the key discrimination signal output from pins 15 – 18 is fed via the operation button.
20			MATRIX 2	
21			MATRIX 3	
22			MATRIX 4	
23			MATRIX 5	

	I/O	μ P			
		15	16	17	18
μ P	19	Frame-advance	◀ Search	Search ▶	
	20	Slow	Channel	Rewind	F. FWD
	21	Stop	Pause		ON/OFF
	22	Tracking ▲	Tracking ▼	Speed ▲	Speed ▼
	23	Play			

Table A SERIAL CODE LIST

Operation mode	Symbol	Serial code							
		1	2	3	4	5	6	7	8 ~ 16
Reverse search	◀ SEARCH	0	0	0	1	0	0	0	1
Forward search	SEARCH ▶	0	0	1	0	0	0	0	1
Slow	SLOW	0	1	0	0	0	0	0	1
Channel	CHANNEL	0	1	0	1	0	0	0	1
Rewind	REWIND	0	1	1	0	0	0	0	1
F. FWD	F. FWD	0	1	1	1	0	0	0	1
Stop	STOP	1	0	0	0	0	0	0	1
Pause	PAUSE	1	0	0	1	0	0	0	1
Power supply	POWER	1	0	1	1	0	0	0	1
Slow tracking ▲	TRACKING ▲	1	1	0	0	0	0	0	1
Slow tracking ▼	TRACKING ▼	1	1	0	1	0	0	0	1
Slow speed (gets faster) ▲	SLOW SPEED ▲	1	1	1	0	0	0	0	1
Slow speed (gets slower) ▼	SLOW SPEED ▼	1	1	1	1	0	0	0	1
Frame-advance	F. ADVANCE	0	0	0	0	0	0	1	1
Play	PLAY	0	0	0	0	1	0	0	1
Dubbing	DUB	0	0	0	0	1	0	1	1
Record	RECORD	0	0	0	0	1	1	0	1

REMOTE CONTROL RECEIVER IC (IC401) PIN SPECIFICATIONS

μPD554C-90

Function: Remote control reception signal decoder

Pin	I/O	Active Level	Abbreviation	Function
28 1	—	—	CLK	External oscillator connection pins.
2 3 4 5	O	Hi	L ₀ L ₁ L ₂ L ₃	Output pins with the operation mode decoded to 4 bits. Output as shown in Table A corresponding to the operation mode.
6 7 8 9	O	Hi	S ₀ S ₁ S ₂ S ₃	Output pins with the slow speed decoded to 4 bits. Output as shown in Table B corresponding to the slow speed button operation. Speed varies by up to 16 steps max.
10 11 12 13 16 17	O	Hi	T ₀ T ₁ T ₂ T ₃ T ₄ T ₅	Output pins with the slow tracking decoded to 6 bits. Output as shown in Table C corresponding to the slow tracking button operation.
14	I	10V	V _{SS}	Power input pin.
18	O	Hi	CH-UP	Outputs channel up signal corresponding to the channel button operation.
20	O	Hi	POWER	Controls power ON/OFF by the power operation.
21	I	Serial pulse	IN	Receives the transmitter output. Outputs the 16-bit serial pulse in parallel.
26	I	Hi	RESET	Reset pulse input pin. By this, the μP is reset.
27	I	O	VGG	GND pin of μP.

Table A OPERATION MODE OUTPUT

Operation mode	Symbol	IC401 pins 5 4 3 2	IC406 pin 1
Reverse search	◀ SEARCH	0 0 0 1	6.4 (kΩ)
Frame-advance	FRAME ADV.	0 0 1 0	21.4
—	—	0 0 1 1	—
Record	RECORD	0 1 0 0	51.4
Rewind	REWIND	0 1 0 1	3.4
—	—	0 1 1 0	—
Pause	PAUSE	0 1 1 1	0
Play	PLAY	1 0 0 0	111.4
F. FWD	F. FWD	1 0 0 1	4.7
Slow	SLOW	1 0 1 0	15.4
—	—	1 0 1 1	—
Dubbing	A. DUB	1 1 0 0	31.4
Stop	STOP	1 1 0 1	2.3
Forward search	SEARCH ▶	1 1 1 0	8.5
—	—	1 1 1 1	—

1: Hi = 10V
0: Lo = 0V

Table B SLOW SPEED OUTPUT

Number of operation ▼ ▲	IC401 pins 8 7 6	IC407 pins 14
7	0 0 0	192 (kΩ)
6	0 0 1	130
5	0 1 0	93
4	0 1 1	66
3	1 0 0	36
2	1 0 1	24
1	1 1 0	12
Initial state	1 1 1	0

0: Lo = 0V
1: Hi = 10V

Table C SLOW TRACKING OUTPUT

Number of operation ▼ ▲	IC401 pins 16 13 12 11 10	IC407 pin 1
15	0 0 0 0 0	189 (kΩ)
14	0 0 0 0 1	183
13	0 0 0 1 0	177
12	0 0 0 1 1	171
11	0 0 1 0 0	165
10	0 0 1 0 1	159
9	0 0 1 1 0	153
8	0 0 1 1 1	147
7	0 1 0 0 0	141
6	0 1 0 0 1	135
5	0 1 0 1 0	129
4	0 1 0 1 1	123
3	0 1 1 0 0	117
2	0 1 1 0 1	111
1	0 1 1 1 0	105
Initial state	0 1 1 1 1	99
1	1 0 0 0 0	93
2	1 0 0 0 1	87
3	1 0 0 1 0	81
4	1 0 0 1 1	75
5	1 0 1 0 0	69
6	1 0 1 0 1	63
7	1 0 1 1 0	57
8	1 0 1 1 1	51
9	1 1 0 0 0	45
10	1 1 0 0 1	39
11	1 1 0 1 0	33
12	1 1 0 1 1	27
13	1 1 1 0 0	21
14	1 1 1 0 1	15
15	1 1 1 1 0	9
16	1 1 1 1 1	3

1: 10V
0: 0V

TIMER OPERATION CONTROL IC (IC102) PIN SPECIFICATIONS

HD38800A62

Function: 3-week 8-program timer

Pin	I/O	Active Level	Abbreviation	Function
41	O	Hi	G ₈	Channel selection matrix pulse shaping and display grid drive pulses.
42			G ₇	
1			G ₆	
2			G ₅	
3			G ₄	
4			G ₃	
5	O	Hi	G ₂	Key circuit board selection matrix pulse shaping and display grid drive pulses.
6			G ₁	
(Refer to Fig. A)				
7	O	Lo → Hi	CHANNEL UP	When the 16-CH pulse (pin 30) is detected, this pin outputs the same number of pulses as the selected channel number, to select the channel.
8	O	Lo	TIMER ON	Set to Hi at the preset recording time, and Hi during recording. 1. Program execution precedence. Preset time earlier > Those with lower program No. 2. Program executed when power failure is restored. Those which have started before power failure.
9	I	Hi	REMOTE CH-UP	Receives channel selection using remote control. The channel-up output is obtained from pin 7 by this operation. Single-shot pulse (100msec.) is output from pin 7 for every operation.
10	I	Lo	P. FAIL	Detects power failure when this pin is set to Lo. Inhibits input/output of μP during the backup period. By this, the display does not function during the backup period.
11	I	—	CLOCK	Input pin of clock pulse which is the reference of μP.
13	O	Hi	Hz/Hr	Frequency of μP and the time display system are changed over by applying this output to the matrix pulse. Hz selection: Connected to pin 23 60Hz Not connected 50Hz Time selection: Connected to pin 24 24Hr Connected to pin 25 12Hr
14	I	—	Vdisp	Supplies -B power to the output buffer in μP for G ₁ - G ₈ . Luminance of the display is changed by changing this potential.
15	I	Hi	RESET	Resets μP when the power is supplied.
18	I	—	OSC 1	External oscillator connection pin.
22	I	Hi	MATRIX 1	Combine G ₁ - G ₈ using keys and produce matrix pulses. The program is stored by these pulses. (Table A)
23			MATRIX 2	
24			MATRIX 3	
25			MATRIX 4	
26	I	Lo	TIMER	Inputs that the timer mode is entered.
27	I	Hi	POWER	Inputs that power is supplied to the RF section. (T12V) (Channel selection possible)
29	O	Hi	LED CONTROL	This is the output to make the 16-CH lamp go off when the timer switch is set to ON.

Pin	I/O	Active Level	Abbreviation	Function
30	O	Hi	16CH	Reference channel during channel selection. μ P generates the pulse corresponding to the number of the channel after receiving this channel signal. Selection of 16-CH is instructed by the timer stand-by, power OFF.
32	O	Hi	a, 3	3: 3rd week 2: 2nd week ON: Start, PF: Power failure OFF: Finish, CH: Channel selection Program number Day of week * Light synchronized with the grid drive pulses G ₁ - G ₈ .
33			b, 2	
34			c, ON, AM, PF,	
35			d, OFF, PM, CH	
36			e	
37			f	
38			g	
39			1 - 8	
40			SUN - SAT	

Table A 8 ϕ PULSES AND SEGMENT DRIVE PULSES & MATRIX PULSES

		8φ PULSES							
		41 G 8	42 G 7	1 G 6	2 G 5	3 G 4	4 G 3	5 G 2	6 G 1
(22)	MAT 1	1CH	2CH	3CH	4CH	1 SUN	2 MON	3 TUE	PROGRAM
(23)	MAT 2	5CH	6CH	7CH	8CH	4 WED	5 THU	6 FRI	CLEAR
(24)	MAT 3	9CH	10CH	11CH	12CH	7 SAT	8 DAILY	9 WEEKLY	
(25)	MAT 4					0 2WK/ 3WK	AM/PM	Hr/Min	CLOCK
(32)~(40)		23	SUN	MON	TUE	WED	THU	FRI	SAT
(SEGMENT DRIVE PULSES)	ON OFF	AM PM			:			CH	
		1	2	3	4	5	6	7	8

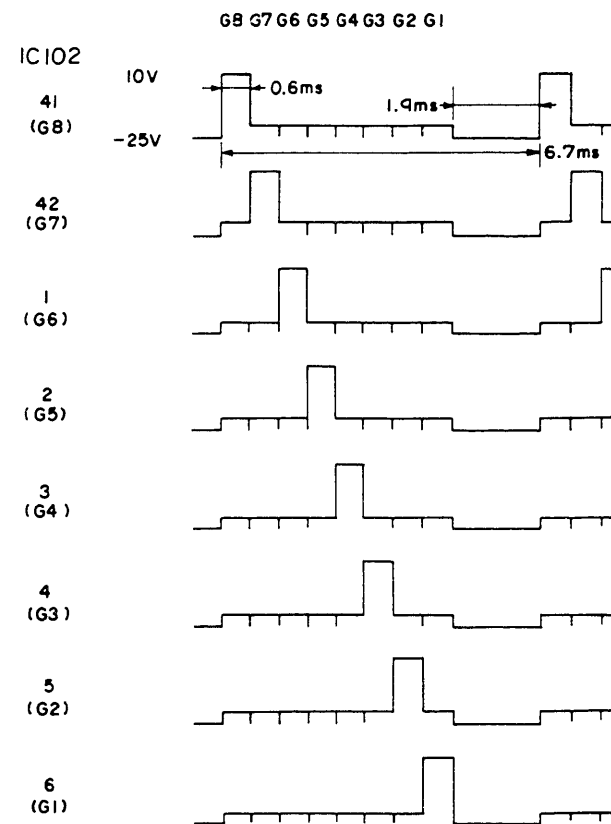


Fig. A 8 PHASE PULSE



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